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Table of Contents

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ORIGINAL ARTICLES— Page.

An Address—The Control of Maternal Mortality and Morbidity, by R. MARSHALL ALLAN, M.C., M.D., F.R.C.S., F.R.A.C.S., F.C.O.G., F.A.C.S. (Hon.) 551

A Note on the Social Aspects of Rheumatism, by F. JOHN POYNTON, M.D., F.R.C.P. 555

The Interpretation of MacLean's Urea Concentration Test in Assessing Renal Function in Pregnancy, Part I, by VERA I. KRIEGER, M.Sc. 557

Some Further Results of Short Wave Therapy, by K. R. SPEEDING, M.B., B.S., Dip.Rad. 565

Dislocation of Intervertebral Disks, by R. A. MONEY 571

Observations on the Heights and Weights and Growth of Pre-School Children in the City of Melbourne, by HILDA E. KINCAID, D.Sc., M.B., B.S., and MARGARET STUCKEY, B.A. 575

REVIEWS—

The Royal Infirmary of Edinburgh 581

Obstetric Management 581

The Education of the Emotions 582

LEADING ARTICLES—

Rheumatism in Australia 583

CURRENT COMMENT— Page.

The Effect of Mercurial Diuresis on Congestive Heart Failure 584

Anxiety States and Certain Related Physical Phenomena 585

ABSTRACTS FROM CURRENT MEDICAL LITERATURE—

Bacteriology and Immunology 586

Hygiene 586

BRITISH MEDICAL ASSOCIATION NEWS—

Scientific 588

Nominations and Elections 591

MEDICAL SOCIETIES—

The Melbourne Pædiatric Society 591

OBITUARY—

Frederick Archibald Hope Michod 595

AUSTRALIAN AND NEW ZEALAND ASSOCIATION OF RADIOLOGY 595

DIARY FOR THE MONTH 596

MEDICAL APPOINTMENTS 596

MEDICAL APPOINTMENTS VACANT, ETC. 596

MEDICAL APPOINTMENTS: IMPORTANT NOTICE 596

EDITORIAL NOTICES 596

An Address.[1]

THE CONTROL OF MATERNAL MORTALITY AND MORBIDITY.

By R. MARSHALL ALLAN, M.C., M.D., F.R.C.S. (Edinburgh), F.R.A.C.S., F.C.O.G., F.A.C.S. (Hon.),

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IN choosing a subject to address the section I feel that nothing could be more useful than a short survey of the present position regarding the control of maternal morbidity and mortality. Some of the more important clinical aspects will be presented in detail by various speakers during the sessions, and they can be trusted to deal adequately with such matters.

But the broad principles need constant emphasis, for the importance of the problem lies not merely in the aggregate number of maternal deaths, but on certain allied factors—the occurrence of such deaths in the prime of life when the general rate is low, the disorganization of family life and the associated infant losses. Two lives are always at stake during delivery, and the sum total of maternal and infant deaths gives rather staggering figures, especially in these days when motherhood is so largely avoided. Reference must also be made to the indefinite amount of invalidity not resulting in death, but causing much preventible ill-health. Viewed from the standpoint of the preservation of

[1] President's address read before the Section of Obstetrics and Gynæcology at the fifth session of the Australasian Medical Congress (British Medical Association), Adelaide, August, 1937.

the race, no problem in present-day medicine exceeds it in importance.

It may well be contended that in recent years there has been much propaganda, particularly in the political field, and that the matter has been frequently discussed at various meetings of congress; but are we satisfied with the progress which has been made? This is what Sir Henry Brackenbury had to say recently:

> The death of a mother during the child-bearing period with a child or children to look after can never be anything but a dire disaster both individually and sociologically; and the community, whether or no it actively encourages maternity on the one hand, is bound in duty to take any step which it can to make it safe on the other. To promote research into the causes of danger, to promulgate the results of such research and to make adequate provision in every possible direction to reduce the danger to a minimum, are the obvious steps to be taken.

He was referring to conditions in Great Britain, where governmental action along certain lines has been active; here, where the efforts have been more sporadic and ill-sustained, can we refute his statements?

Two years ago the jubilee appeal afforded an opportunity for stocktaking which was availed of in every State; it culminated in a conference at Canberra, which began with high hopes but actually achieved very little of permanent value. However, this stone wall of apparent indifference should only act as a challenge to the profession to renew its attempts to influence public policy in the right direction.

The Statistical Position.

The failure of the maternal mortality rate to yield to the attack directed against it, and indeed its tendency in some respects to react in the opposite direction, have endowed the subject with an air of mystery and even fatalism. This has been accentuated by various international comparisons of death rates, made generally by those who have no real knowledge of the subject nor of the varying standards noted in many countries. For example, during the investigation at Rochdale it was discovered that there was in the certification an error of 44%, which was brought to light merely by chance. Such criticism cannot be levelled at the Australian figures, for a careful scrutiny is made of all death certificates of women within the child-bearing ages. This tends to make our figures higher than those of many other countries, but it is not an excuse for satisfaction with the present rate.

The classification adopted for compilation of the mortality rate is undoubtedly unsatisfactory from the clinical standpoint, but for the present it is the only one available, and until our protests are heeded by the statisticians it must be accepted. It is clearly absurd that deaths from abortion, hyperemesis and ectopic pregnancy should be included in the rate purporting to give the risk experienced by women in delivery at term. This risk is exaggerated also by counting live births only as the denominator while deaths at all stages of pregnancy comprise the numerator in the fraction.

The Main Problems.

The main problems facing the profession are: (i) the elimination of those conditions which determine the occurrence of puerperal infection; (ii) the recognition and adequate treatment of the conditions responsible for the development of the toxæmias and hæmorrhages associated with child-birth; (iii) the changes yet necessary to make the training in and the practice of obstetrics more effective.

Puerperal Infection.

The term "puerperal fever" covers a wide range of pathological conditions which are merely successive stages in the development of a wound infection. Only too frequently the term is reserved for the more severe manifestations, while the significance of a mild transient pyrexia is overlooked. It is forgotten that such apparently innocent conditions are the cause of future invalidism and may indeed prove fatal to a woman in a subsequent pregnancy.

We know that the streptococcus is the most important organism concerned and that it is usually responsible for all serious attacks. Lowered resistance due to hæmorrhage before or after delivery or to toxic states plays a part, while the majority of cases are associated with prolonged delivery requiring interference. Much work has been done regarding the sources of infection. The question of autogenous infection has long been debated, but, while pathogenic organisms are frequently present in the genital tract before labour, they are not important factors in the causation of infection. We are indebted to Colebrook for showing the importance of droplet or spray infection arising from upper respiratory tract infection in the attendants or others in close contact with the patient. This work has largely solved the problem of infection arising when no interference has taken place.

When an infection has occurred, many points require elucidation. Has the necessary machinery been available for prompt diagnosis, isolation and treatment? Was a bacteriological examination undertaken or was its omission mainly a matter of lack of facilities? Was the patient promptly and adequately isolated so that others would not suffer? Were attempts made to detect any carriers and to isolate them from other patients until they were free from infection? From a somewhat extensive knowledge of outbreaks in Victoria I feel that much yet remains to be done before we can be satisfied with the answers to these questions.

One of the urgent needs in Melbourne at least is the erection of a separate block for the reception of patients with suspected or proven sepsis. Such a block would accommodate all classes of patients, especially private patients, for whom there is no adequate provision at present. If at training hospitals it is essential to require masking of all those in contact with patients during labour, why should obstetric work elsewhere not follow the same rule? Yet to my knowledge this has been neglected in many instances. Masking alone, of course, will

not prevent sepsis, but it will keep before the accoucheur the importance of such sources of infection. A standard routine for the technique of delivery should be employed in every case. It has been done successfully in New Zealand and would not be difficult here after consultation between the health authorities and local experts.

Undoubtedly one of the reasons for the increase in the septic risk has been the change during the present century in the methods of practice. There has been a constant extension of the indications for interference during labour and a considerable increase in the number of operative deliveries. The wide adoption of anæsthesia, admirable in many ways, has also caused more frequent recourse to forceps delivery, while improved hospital facilities have tended to encourage operative interference. The stressing of the importance of detecting and treating abnormalities seen during pregnancy has caused in some instances mistaken notions regarding disproportion, the danger of the unengaged head at term, or of a breech presentation. At times there is also a tendency to exaggerate the value of the child's life as compared with the life and health of the mother. F. J. Browne has well expressed this dissatisfaction with the failure of some methods employed in antenatal supervision to reduce the mortality adequately:

> Unnecessary operations really rescue patients from the hypothetical consequences of an abnormality and kill them in affecting the rescue.

A low rate depends, therefore, upon endeavours to obtain a spontaneous labour with the avoidance of interference as far as possible. So the most important factor in the prevention of puerperal infections is the personal one. As Colebrook has stated, we must count on a high standard of intelligent vigilance coupled with conscientious work. Unless this is done, masks, gloves and antiseptics will not prevent outbreaks.

The increase in the number of abortions within recent years shows only too plainly one of the modern factors which have imposed an additional load on the hazards of childbirth. As the maternal mortality rate is at present calculated, it is placed largely at the mercy of the abortionist. Septic and criminal abortions are responsible for 35% of the total puerperal death rate in the Commonwealth. Apart from these deaths there are infinitely more numerous cases in which recovery occurs, leaving a legacy of ill-health and much avoidable disablement.

The increasing prevalence of abortion appears to be due to a change in the social outlook towards large families and to the modern desire for pleasure and freedom at any cost. Another factor of undoubted importance is the widespread use of contraceptive methods which, if unsuccessful, lead many women to abortion as the remedy for their failure to prevent pregnancy. As I have suggested elsewhere, the State could assist in easing the economic factor which is alleged to be the main cause of abortion, by increasing the tax exemptions for children and by extending the range of the income limit beyond the present levels. But the medical profession has also a duty to perform and should not drift along with the tide of uninformed public opinion. Rather we should render a service to the community by using all our knowledge and influence to explain the dangers and risks of abortion and thus help to tighten up the moral fibre of the population.

The Toxæmias of Pregnancy.

As is well known, the toxæmias of pregnancy play a very important rôle in maternal morbidity and mortality. Despite widespread antenatal supervision, the toxæmias still constitute the major factor with which we have to deal in Australia. While the ætiology remains unsettled, we must concentrate on early diagnosis and energetic treatment. The effect of a well-balanced diet in preventing the onset of toxæmic symptoms has been stressed by several Australian writers, notably Watson Brown, of Longreach. I commend to your notice his admirable clinical survey of the incidence of toxæmia and the deficiencies in diet of residents in our outer districts. Despite the benefits of climate and fresh foods, there seems to be a tendency in Australia to overload diets with sugars and starches, and there is also a deficiency in the essential vitamins and mineral substances. Research into these factors is being pursued actively at present and before long we should be in a position to deal with this problem.

Too many patients are still sent to hospital late in the duration of the illness and often with a history of inadequate treatment. This is not necessarily the fault of the medical attendant, but the need for sending all patients to hospital before treatment is instituted still requires emphasis. The modern tendency is to terminate pregnancy earlier than it was terminated in the past if no improvement is noted. We still lack definite clinical evidence during pregnancy which will enable us to detect chronic nephritis in the early stages.

The Hæmorrhages of Pregnancy.

The prevention of accidental hæmorrhage is largely bound up with the early recognition and prompt treatment of toxæmic symptoms. While treatment of the condition tends to become more conservative, this is in marked contrast to the use of abdominal section for *placenta prævia*. This has given improved maternal and fœtal results, but there is still a place for the older conservative lines of treatment in such cases.

Neither of these causes of death from hæmorrhage, however, plays as important a rôle as does *post partum* hæmorrhage. Its occurrence is so intimately connected with the proper supervision of the third stage that its frequency points to a failure to appreciate the principles regarding the correct management of this period in delivery. The number of cases in which expression or manual removal of the placenta is necessary affords a good index of the standards of work of an obstetrician. If these

are numerous, a careful scrutiny of the methods employed should be made. The effects of undernourishment during the years of development tend to cause weakness in the genital apparatus, which may later find expression in uterine inertia and *post partum* hæmorrhage. This factor was noticeable during the years of economic depression.

The Training of the Obstetrician.

In all reports on the training of the obstetrician the importance of undergraduate training and of post-graduate opportunities for further work has been emphasized. At the main medical schools obstetrics has been allotted a greater share in the curriculum and the subject is taught in a very practical manner. Difficulties are arising in the larger schools from the increase in the numbers of students outstripping the available clinical material for instruction. This has been made acute by the necessity to give trainee midwives an equal number of cases, despite the fact that so many nurses do not intend to practise obstetrics later. It will have to be recognized that the interests of future practitioners are paramount, and that if any reduction of cases is required, this should be borne by the nurses. The question of limiting the number of students in the clinical years is also engaging the earnest attention of some faculties. It is a problem bristling with difficulties, some of them political.

The standards and coordination of teaching throughout the Commonwealth would be greatly assisted by the exchange of professors for examination purposes; but this is impossible because of lack of funds. Modern methods of travel are rapidly bringing the Old World nearer, and with this closer contact it is not too much to visualize an exchange scheme between teachers here and those overseas, to our mutual advantage.

Apart from awards at the final examinations, junior graduates do not enjoy the range of travelling scholarships available to those in other faculties. It is true that obstetrics shares at intervals in the award of the Walter and Eliza Hall Scholarship in Sydney. Now, thanks to the generosity of Dr. T. G. Wilson, Adelaide graduates will have the opportunity to improve their knowledge abroad with the added prestige of being a travelling scholar. We heartily applaud the foresight shown by one for so long a trusted leader in obstetric education, and sincerely trust that his public-spirited action will act as a stimulus to senior practitioners elsewhere, especially in Melbourne, to emulate his gift. New Zealanders have had sufficient experience with their scheme for them to know how valuable it is in attracting the best of the younger graduates to the practice of obstetrics and gynæcology.

Research has been impossible under present conditions at the universities, for the staffs are fully occupied with routine clinical teaching. The formation of the National Health and Medical Research Council arouses hopes that funds will be available for work on some of the pressing problems of toxæmia and sepsis by those fit to undertake this research. The erection of a pathological laboratory in Melbourne will encourage other schools to make efforts to obtain similar advantages for research work.

With the establishment of maternity wards at many country hospitals the opportunity of post-graduate training before practice is started is increasing. Similarly the action of the Victorian Charities Board in insisting on specialist service at the main country hospitals will stimulate men to undertake obstetric responsibilities. It is to the credit of many of our younger graduates that they have gone overseas and obtained membership of the British College of Obstetricians and Gynæcologists. By the ever-growing numbers of Fellows and Members of the College the Commonwealth is rapidly acquiring a corps of specialists competent to assist the authorities in any schemes to improve the present situation. Each State possesses energetic post-graduate organizations, and emphasis has been laid on obstetric refresher courses. However, in Victoria of recent years a decrease in the numbers attending such classes has been noted. It must be only a temporary phase, for one can hardly take the view that the average practitioner considers that he knows all that is necessary to keep himself up to date.

Gradual improvement will come only when the many factors involved are tackled, not singly, but all together. The State has yet to realize that public health demands money, although the purchase price is well worth while. In Great Britain much thought has been given to the matter, mainly along the lines of governmental control, with the gradual elimination of the general practitioner from such work. This is wrong, both for the practitioner and in the interests of prospective mothers. The British Medical Association has evolved a scheme for a national maternity service which is more in agreement with our desires.

Sooner or later we must face the same problem here—a national scheme with government control of all those associated with obstetrics, or a continuation of the present methods whereby the State exercises control by means of various acts and regulations but leaves the details of practice to those most concerned. State control must naturally continue in regard to the training and inspection of nurses, the choosing of sites for hospitals, their construction and equipment, and all measures connected with sepsis and the investigation of maternal deaths; but in the actual conduct of obstetrics the continuation of an unfettered relationship between the medical attendant and his patient is to be desired.

There is an urgent need for the investigation of the circumstances surrounding maternal deaths, such as that undertaken in New South Wales and New Zealand. Until this is done we are largely groping in the dark. It would form a survey of present-day practice whereby we could tell

accurately the reason for the gap between the ideals of modern knowledge and actual practice. When this has been done we shall be in a position to effect more adequate coordination of the existing services. It will also enable us to determine the possible existence of "black" as compared with more favourable areas. Then we can adopt the methods employed so successfully at Rochdale—arouse the interest and cooperation of the doctors concerned and at the same time judiciously encourage patients to come under continuous medical care throughout pregnancy and labour. Improvement cannot be regarded purely as an administrative problem, as some are prone to think. Good work done in the training centres will demonstrate to students and resident medical officers how to develop an obstetric conscience, which will make them proof in later years against the temptations of hurry and unnecessary interference.

Much of the experience of the larger hospitals in Australia is at present wasted. I trust that soon each will issue detailed annual reports of their work along the lines of similar British institutions. By this means we shall assist our fellow practitioners here and also show to the overseas world that our work can bear comparison with the best elsewhere.

The Wider Concept of Obstetrics.

This address has been devoted to a discussion of the major factors connected with the problems of maternal mortality. Maternity, however, cannot be regarded as an event in the life of a woman which can be marked off from all that has gone before or is to come later. It must not be forgotten that the first essential for safe maternity is a well-built, healthy body. So the problem envisages a wider horizon than one concerned merely with pregnancy and labour. We must go back to the infant girl and help to guide her through childhood and during the school years, encourage training in domestic science and motherchaft, and so fitly prepare her for the crowning glory of womanhood.

Beyond the actual delivery stands the necessity to restore our patients to good health. This post-natal supervision is still much below even reasonable standards. Much of the fault lies with our patients, and we must continue with quiet persistence until a greater measure of success is attained. Such work includes not only the diagnosis and treatment of various gynæcological complaints at the earliest stage, when they are often remediable by simple methods, but also is concerned with contraceptive advice to those whose health would be imperilled by a further pregnancy.

Obstetrics and gynæcology are vitally concerned with race in its widest sense, and in recent years the field has been enlarged to include many of the problems of eugenics and sociology. The importance of follow-up studies is seen particularly in regard to the infant. How little we know about the effect of a difficult delivery on the children who survive a stormy neonatal period. Here the neurologist anxiously awaits our cooperation.

In many respects our subject represents, more than any other branch of medicine can do, the practical side of biology. It is an error to claim that obstetrics is merely a surgical specialty. The accoucheur certainly requires a surgical conscience, but general surgeons are not the best consultants in cases of difficulty, for they naturally think surgically, with its bias to Cæsarean section. A knowledge of general medicine is much more essential to the equipment of a good obstetrician.

Finally, the stress on antenatal treatment has tended to give an impression that it is an end in itself and not merely a means to an end. No strict attention to the various matters emphasized in such care can save the patient if the most important factor—good obstetrics—is not available. Improvement, therefore, is largely connected with the problem of maintaining student and post-graduate training and practice as near to the ideal as possible.

In conclusion it is generally agreed that the wider the experience gained in the management of obstetric cases, the more conservative does one become in treatment. "Wait and see" is not a bad rule to follow, provided that it is tempered with judgement.

The opinion of the great master of British obstetrics, Smellie, still remains as a guiding beacon:

> We ought to go in the middle way, never to assist but when we find it necessary; on the one hand not to torture nature when it is self-sufficient, nor delay it too long.

A NOTE ON THE SOCIAL ASPECTS OF RHEUMATISM.

By F. John Poynton, M.D., F.R.C.P. (London),

Consulting Physician to University College Hospital, London, the Hospital for Sick Children, Great Ormond Street, and the West Wickham and Ivinford Heart Homes.

I am venturing to write upon rheumatism, or, as I would prefer to say, "rheumatisms", for the word in the singular does not cover the field. I venture to do so because for forty years I have personally studied the subject from its various aspects of causation, clinical history and treatment.

I fear it is a dull subject, but its importance must be my excuse, and there is so much to be learned about its problems.

My approach here is from one aspect, and this is the influence of climates and surroundings upon the incidence. This study has brought me in touch directly or indirectly with great investigators throughout the world, and all, I believe, agree that the actual causations of these diseases are so controversial and so difficult to elucidate that we cannot afford to wait for their solutions. We must attack the problem of prevention, searching for influences which we may be able in part to control and which.

if controlled, will diminish their frequency. Meantime the discovery of the exact and direct causes will be continually pursued.

The Macroclimate.

There are two aspects of climate, not accurately defined the one from the other, which attract our attention, and for which I shall use the useful terms introduced by Professor Danishvewsky, of Moscow: the macroclimate or general climate, and the microclimate, that is, the conditions and environments of dwellings—either the home or the factory, mine, workshop and so on, in which many pass much of their active lives.

There can be no doubt that careful and sustained investigations throughout the Empire upon these questions will not only be of great service to us in Great Britain, but to the whole world.

It may well be that these diseases may not, as here, take such a prominent part in the health of the people of Australia, Canada, India, South Africa and New Zealand, for examples, and we cannot expect, if this is the case, that they will have as yet attracted so much attention. Nevertheless, all careful information, whether it is positive or negative, will be of assistance to those studying the subject in countries that are known to suffer greatly. Certainly, from Australia, Canada and India I have reason to believe that there are warnings that these diseases need careful study and that possibly the extent of the damage they do is not yet realized.

The macroclimate may be subdivided into general and local. In a small country such as Great Britain the differences between these two are not great, although it is held that rheumatisms are less frequent in the drier eastern side than in the hilly and wetter west. Our general climate is unusual, for we stand between three great weather systems: the Azores, the Continental and the Icelandic. True, we have no prodigious rains or extremes of temperature, but our weather is most uncertain; sudden changes are very frequent, and rain in some districts may fall for two hundred days in the year. We are in one of the most cloudy regions on earth, with much fog and mist, and comparatively little sunshine.

We know certainly that rheumatisms are more frequent in the cold and variable winter months here. For us all forms of rheumatism are important. Exact figures cannot be given, because there is no notification. The Ministry of Health some years ago estimated that there were 35,000 children with heart disease due to rheumatic fever in England and Wales, which I suspect to be an under-estimate. During the year 1935 to 1936 it was estimated in Scotland that from every kind of rheumatic affection over three and a half million working days were lost among the insured population. The Ministry of Health stated that in 1927 £5,000,000 were paid in health insurance for the rheumatic.

That is enough of statistics to show the reality of the gravity of our problems.

It is curious that in Holland rheumatic fever and heart disease are much less frequent, though the chronic forms are about as frequent. There is no explanation for this at present, and I mention it to show how much we may possibly learn from Empire experiences upon curious diversities in incidence.

We do not know here how much rheumatism is dependent upon the macroclimate and how much upon the microclimate; we are not sure which rheumatisms are due to infection and which are not, though there is general agreement that the juvenile form is due to infection, and many cases of rheumatoid disease are suspect.

Leaving now the macroclimate, I touch upon heredity, poverty and the adaptability of the human being.

Upon heredity there is difference of opinion, but here I think it is established. In 183 well-to-do children the figure was from my estimate 53%, for another group (these were hospital patients) 40%. T. S. Preston gave 45%. K. Wilkinson gave about 70%, H. Wallace in Scotland 30%. The Empire, I am sure, will contribute further evidence upon this question, which is one both of scientific and practical interest. The figures given apply to juvenile rheumatism, but for rheumatoid arthritis and osteoarthritis there are also figures around 40%.

All countries agree that these diseases are more frequent among the poorer classes. There are, of course, many more poor than well-to-do; but we see juvenile rheumatism also among the well-to-do, as I can personally testify, and Professor Hodge, from Calcutta, Dr. K. Maddox and Dr. Boyd Graham, from Australia, support our experiences here. Let us accept that it is more frequent among the poor: the fact that it does occur among the well-to-do shows that the complex of poverty does not explain everything.

There is a certain amount of evidence that juvenile rheumatism is more frequent among those just above the limits of great poverty, though many observers are doubtful about this. I mention it because, though we cannot tolerate this condition of great poverty, those accustomed to great poverty may become, as it were, adapted to it, and not necessarily become victims of rheumatisms, but as a result develop more frequently tuberculosis.

The Microclimate.

Now I mention some important points about the microclimate.

This old country has a legacy of many dreadful houses, and our government, striving with this, has already built over three million new houses and is steadily clearing slums. It is a tremendous undertaking, when it is realized that in the rural districts of only one county, in 1935, 5,175 houses were condemned; that in 1937 the Scottish report on rural housing found in three parishes 41% of damp houses and a large number unfit for human habitation; that in 1935 in a large manufacturing

town 4,750 houses were so dangerous and unfit as to be condemned.

If we consider overcrowding, in 1936 the Ministry of Health tells us nearly nine million houses were inspected and nearly 350,000 were found to be overcrowded.

If we consider nutrition, Sir John Orme in 1936 considered that 50% of us were under-nourished and four and a half million of the poorest had a diet lacking in all vital constituents.

I confess myself to be surprised, but it is evident we want to know more about under-nutrition and rheumatisms, and I should also like, from the experience of the Empire, to know more about over-nutrition and so-called rheumatic fibrositis. There are many scientific investigations to be made also about house warming, the best methods of building small houses, and about electrical disturbances and so on. We here are still greatly concerned with gross defects and whether or not houses must be destroyed.

Again, when rapid building on a huge scale is needed, there are the snares of bad building: of the house that commences to fall down or needs the grass to be mown in the ground floor rooms, or leaves you bankrupt over repairs.

Have we evidence here that cold, damp, overcrowding and under-nutrition favour rheumatisms? We have, and I can say in other words that a bad microclimate favours these diseases, certainly indirectly and probably in some forms directly. Continental authorities are of the same opinion. The Empire is pointing in the same direction. I think, then, that our experiences may be helpful. We have not great open spaces and abundant sunshine, we are mending faults in a small and crowded country, much urbanized.

Need you repeat our mistakes, with your fresher outlook on life? Need you allow slums, build poor houses or overcrowd them, only to find out the same truth and to correct it when the damage is already great? I think not.

You have already evidence that though rheumatisms may differ in detail with you, they have the same essential dangers.

From Australia, India and Canada I hear in the large towns of children with rheumatic heart disease. The warnings have been given by physicians in these countries and these will lead to further inquiries into all forms of rheumatism, for all will be forewarned by our troubles.

How much, too, we shall learn from you! There is a belief here that in India these diseases are very rare. Recent literature tells us it is more frequent than we think. Did many of us realize here that in Montreal juvenile rheumatism was a very serious disease between the ages of five and fourteen, and at a rough estimate there were 25,000 children in Canada with heart disease; or that rheumatism was well known in Sydney and Melbourne, and was more frequent in the latter? Did we realize that rheumatic heart disease was a frequent complication there; that the juvenile form was chiefly in the poorer quarters and that tonsillitis was frequent? I doubt.

We want to know much more about microclimates, that is, the housing, the building, the overcrowding and future plans. Much more, too, about macroclimates from the special aspect of rheumatisms.

Living here, possibly I may have been too confident about some of my statements, but to be corrected in honest endeavour is wholly good. Space prevents my dealing with the microclimates of mines and factories and so on, and the complicated problems they present, and our efforts in this country to improve things. Lastly, should I appear to have written overmuch as a school master, you will forgive me when I say that my only concerns are the rheumatic and particularly the rheumatic children.

THE INTERPRETATION OF MacLEAN'S UREA CONCENTRATION TEST IN ASSESSING RENAL FUNCTION IN PREGNANCY.

By VERA I. KRIEGER, M.Sc. (Melbourne).

(From the Biochemistry Department, University of Melbourne, and the Women's Hospital, Melbourne.)

PART I.

THE ADVANTAGE OF DETERMINING RENAL EFFICIENCY BY TOTAL UREA EXCRETION RATHER THAN BY CONCENTRATING POWER IN TESTS WHEN HIGH PERCENTAGES OF UREA OCCUR IN SMALL VOLUMES OF URINE.

SINCE MacLean and De Wesselow[1] published the urea concentration test for estimation of renal efficiency in 1919, the experience of many workers has verified their assertion that this is a simple test giving more information in the majority of cases than any other. Opinions of its value were expressed in discussions on the determination of renal efficiency from the biochemical, clinical and surgical points of view by Hansman[2] and Earlam[3] in 1930.

In obstetrics, Green and Krieger[4] have shown this test to be more discriminating than any other of the chemical conditions investigated in toxæmias of pregnancy. In several cases poor results to urea concentration tests were observed, and although the clinical findings at the time did not indicate renal inefficiency, later severe kidney damage was proved. On the other hand, it was observed that a clinical condition suggesting severe nephritic derangement was frequently associated with normal results to renal function tests. Hence a study has been made of conditions which might lead to such apparently normal urea concentrations being obtained.

The procedure adopted by MacLean and De Wesselow[1] was as follows. The patient is instructed to take as little water as possible for twelve to eighteen hours prior to the performance of the test. The bladder is completely emptied and

then 15 grammes of urea in 100 cubic centimetres of water are given by mouth. The bladder is again completely emptied after intervals of one hour and two hours. If the concentration of urea in either of these samples is at least 2%, the kidney is regarded as "fairly efficient". "The higher the concentration, the more effective is the renal function."

Urea is a potent diuretic, and frequently the urine in the first hour is very dilute; hence the concentration of urea in the second specimen is taken as representing the renal efficiency, provided the volume of urine in this sample does not exceed 120 cubic centimetres. Sometimes it is necessary to collect a third specimen, and occasionally the diuresis is so great as to necessitate repetition of the test after total restriction of water for the twelve to eighteen hours prior to the test. MacLean and Russell[5] state that if no other signs of renal disease are present, the passage of very large amounts of urine giving comparatively low urea concentration is dependent on the diuresis and does not indicate kidney disease. No more than 150 cubic centimetres of urine should be passed per hour, and when 350 to 600 cubic centimetres or more are passed in two hours, any tendency to low urea concentration may be put down to the passage of excessive fluid.

Hansman[2] recommends the restriction of fluid to a minimum for thirty-six hours prior to the test and abstinence from all food and fluid for twelve hours. The test is carried out as specified by MacLean, and the sample of urine, three hours after the dose of urea, is always taken. For normal efficiency Table I expresses the requirements.

Table I.

Urea Concentration Test (Normal Values). (Hansman.)

Time.	Percentage Urea.	Volume in Cubic Centimetres.	Albuminuria.
1st hour	1·5 and upwards	150	—
2nd hour	2·5 and upwards	100	—
3rd hour	3·0 and upwards	80	—

In Hansman's opinion, under the conditions specified, the normal kidney of the Australian, provided there is no excessive diuresis, should concentrate urea to about 3% during the second and third hours. He also specifies a sharp diuresis during the first hour and then gradually diminishing output.

Earlam[3] also stresses the value of the urea concentration in the third hour, since in the majority of cases maximum concentration occurs in this specimen. Both these writers also refer to the fallacy introduced by great diuresis throughout the test.

Maxwell[6] states that the diuresis should not exceed 120 cubic centimetres for the first hour, nor 100 cubic centimetres for the second hour.

No mention is made by MacLean or any of these writers as to the effect of a small secretion of urine following the dose of urea due to extrarenal conditions, or to the possible poor response of a damaged kidney to the diuretic. In both these instances an apparently normal or high urea concentration would be obtained. In the application of this test to the estimation of renal function in pregnancy, particularly in *ante partum* tests, this condition is present.

It is well known that in albuminuria of pregnancy there is a tendency to oliguria. In diuresis tests carried out on pregnant patients by McManus, Riley and Janney[7] it was found that after the ingestion of 1,200 cubic centimetres of water 46% less urine was excreted by pregnant patients than by non-pregnant controls. The toxæmic pregnant patients showed a still lower excretion of urine. These were divided into three groups: (*a*) patients with low kidney reserve, (*b*) preeclamptic patients, (*c*) eclamptic patients; and their response to the ingestion of water occurred in that order.

Results of Biochemical Tests.

Observations on Urea Diuresis.

In the following cases the diuresis following ingestion of 15 grammes of urea in 100 cubic centimetres of water was observed in pregnancy and in non-pregnant controls.

The routine adopted for the test was as follows. No food or fluid was taken from midnight till the following 9 a.m. At 6 a.m. the bladder was completely emptied and 15 grammes of urea in 100 cubic centimetres of water were given. Specimens of urine were collected at 7 a.m., 8 a.m. and 9 a.m. The volumes of urine secreted in three hours following ingestion of 15 grammes of urea were measured from nine normal non-pregnant women, from 101 normal pregnant women and 334 toxæmic pregnant women, both groups being in the *ante partum* period.

In the puerperium the urine for the three hours of the test was measured from 33 normal and 234 toxæmic patients. The maximum, minimum and average volumes of urine in each of these groups are correlated in Table II.

Mathematical analysis of the volumes of urine passed in these groups showed that normal non-pregnant patients secreted more urine in this test than normal pregnant patients, but that the variation was not significant. Normal *post partum* patients secreted more urine than normal non-pregnant patients, but again the variation was not significant. This analysis was based on all tests in each group and not only on those in which *ante partum* and *post partum* tests were obtained on each patient.

In normal pregnancy, when all figures obtained were analysed, there was a significant diminution in the urine secreted in the *ante partum* period, and a similar result was obtained for toxæmic patients. A correlation was made between the *ante partum* and *post partum* volumes following ingestion of urea by 156 toxæmic patients when the result of an *ante partum* and of a *post partum* test

TABLE II.

A Comparison of the Volumes of Urine Secreted by Non-Pregnant Women and Normal and Toxæmic Pregnant Women following 15 Grammes of Urea in 100 Cubic Centimetres of Water.

Type of Patient.	*Ante Partum.*				*Post Partum.*			
	Number of Tests.	Volumes in Cubic Centimetres per Three Hours.			Number of Tests.	Volumes in Cubic Centimetres per Three Hours.		
		Maximum.	Minimum.	Average.		Maximum.	Minimum.	Average.
Normal pregnant ..	101	397	61	219	33	410	128	267
Albumin of labour ..	—	—	—	—	19	464	176	269
Albuminuria of four days' duration	46	660	62	218	31	441	143	264
Albuminuria of longer than four days' duration ..	116	591	45	220	92	562	79	290
Eclampsia	16	468	69	263	30	467	162	2[illegible]2
Preeclampsia	3	151	80	123	6	421	124	328
Chronic nephritis ..	8	395	146	218	8	427	240	284
Recurrent toxæmias ..	92	662	83	214	51	446	74	289
Pyelitis	53	397	61	204	10	365	191	290
Normal non-pregnant women	9	380	125	253				

had been obtained from each patient. This analysis confirmed the previous finding that there was diminished secretion in the *ante partum* period in toxæmic patients. The probability that this effect was due to chance alone was not above one in one hundred, even with the inclusion of those tests in which response to treatment was indicated. Unfortunately no such tests were available for comparison among the normal pregnant patients.

No significant diminution could be demonstrated between the secretion of urine in the *ante partum* period in toxæmic patients and that from normal pregnant patients during the same period when all volumes in each group were used in the analysis. This effect might have been due to the inclusion of many toxæmic cases in which definite response to treatment, as shown by the increased volume of urine, had occurred. In some patients several tests were made and response to treatment with marked increases in volume were observed in the later tests.

It is exceedingly likely that in many cases, when the result of only one test was obtained from a toxæmic patient, this would occur in the period of response to treatment. The average secretion in the *ante partum* group of toxæmic patients, assessed on all the volumes obtained, would thus be too high.

A classification was therefore made of those normal pregnant patients (*ante partum*) secreting less than 150 cubic centimetres of urine in three hours and those passing more than this volume. These figures were compared with those in the total toxæmic group (Table III). In this statistical analysis the 435 patients were classified: (i) as to whether they were clinically normal or toxæmic, (ii) as to whether the secretion of urine was normal or low.

The results of the analysis showed that a discrepancy from independence of these two factors is greater than would be expected once in one hundred times by chance alone, that is, there is a definite association between the condition (normal or toxæmic) and the amount of urine passed. The fact that toxæmia is associated with small secretion of urine is thus established.

From these investigations of the urine secreted in pregnancy following ingestion of 15 grammes of urea the following facts emerge: (i) that the secretion of urine is decreased in normal pregnancy,

TABLE III.

A Comparison of the Percentage of Patients secreting Small and Normal Volumes of Urine in Three Hours following Ingestion of 15 Grammes of Urea in Normal and Toxæmic Pregnancy, in Ante Partum and Post Partum Periods.

Type of Patient.	*Ante Partum.*			*Post Partum.*		
	Number of Cases.	Percentage with <150 Cubic Centimetres of Urine per Three Hours.	Percentage with >150 Cubic Centimetres of Urine per Three Hours.	Number of Cases.	Percentage with <150 Cubic Centimetres of Urine per Three Hours.	Percentage with >150 Cubic Centimetres of Urine per Three Hours.
Normal pregnant	101	15	86	33	6	94
Total toxæmic	334	29	71	234	5	95
Albuminuria of four days' duration	46	26	74	31	5	95
Albuminuria of longer than four days' duration	116	31	69	92	2	98
Eclampsia	16	38	62	30	0	100
Preeclampsia	3	67	33	6	17	83
Chronic nephritis	8	12	88	8	0	100
Recurrent toxæmias	92	27	73	51	8	92
Pyelitis	53	29	71	10	5	95

(ii) that this diminution in urinary secretion is much greater in toxæmic pregnancy, (iii) that the secretion of urine after administration of urea is somewhat greater in normal and toxæmic women during the puerperium than that of normal non-pregnant women.

Observations on Excretion of Urea per Three Hours in Urea Concentration Test.

An analysis was made of 698 urea concentration tests on pregnant women grouped in relation to normal urea concentration and normal volume, and irrespective of clinical history.

Normal urea concentration was taken as any set of figures in which the percentage urea was at least 2·5 in one of the three specimens and in which the volumes were of the order of 100 cubic centimetres in the first hour, and at least 50 cubic centimetres in each of the second and third specimens. The results of this arbitrary classification are tabulated in Table IV.

When there was normal concentrating power together with secretion of a normal volume of urine, 92% of tests revealed a total excretion of urea of at least four grammes of urea in three hours. In the remaining 8% the excretion was at least three grammes in three hours. In Group III, in which low urea concentration was found in association with small volume of urine (definitely a nephritic group) 100% of tests revealed an excretion of less than four grammes in three hours, and in Group II, which would include the tests in which concentrating power was nearly normal, 78% of tests revealed an excretion of less than four grammes in three hours. It would therefore be logical to conclude that an excretion of four grammes of urea in three hours would indicate a normally functioning kidney. When the urea concentration was normal but only small volumes of urine were secreted, 64% of tests revealed an excretion of less than four grammes of urea in three hours, suggesting that the concentrating power is not a true measure of renal efficiency.

Results of Tests in which Normal Urea Concentration in Small Volumes of Urine Resulted in Low Three Hours' Excretion of Urea.

In a collection of 703 urea concentration tests on 437 pregnant patients it was found that 65 tests on 51 patients (that is, 9·2% of total tests) revealed this combination of normal concentration with low excretion of urea in three hours. Twenty-five of these 51 patients had severe toxæmia and 46 of the total 65 tests were made in prolonged or severe toxæmias. The analysis of these results is shown in Table V.

Table V.

Distribution of Urea Concentration Tests in which Normal Concentrating Power was associated with Small Volumes of Urine and Low Excretion of Urea per Three Hours in Various Types of Toxæmias of Pregnancy.

Type of Patient.	Number of Patients.	Total Number of Tests.	Tests with High Percentage Urea, Low Volume, Low Three Hours Excretion.	
Normal pregnancy ..	71	84	7	
Normal pregnancy following toxæmic pregnancy ..	26	34	5	15
Albuminuria during labour	20	20	—	
Albuminuria up to four days	53	80	3	
Albuminuria for longer than four days ..	109	207	30	
Recurrent toxæmias ..	63	133	9	
Pyelitis	56	70	9	50
Eclampsia	24	49	1	
Preeclampsia	6	9	—	
Nephritis	9	17	1	
Total	437	703	65	

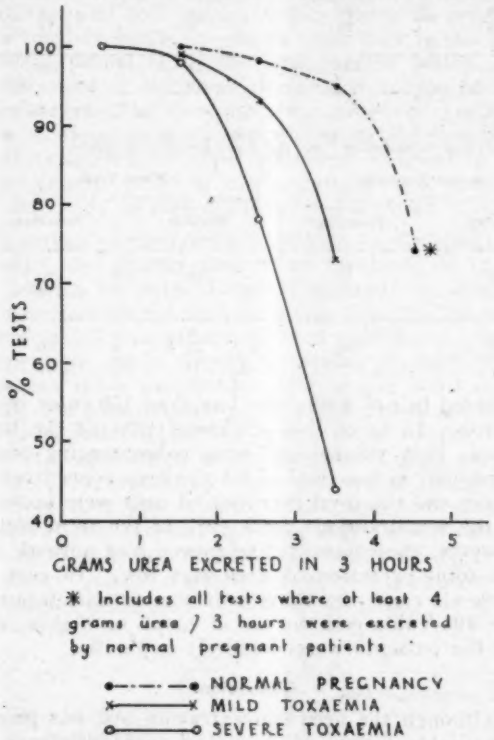
In this group of tests it is interesting to note (Graph I) that whilst in 73% of tests among patients with mild toxæmia there was an excretion of three to four grammes of urea per three hours, only 44% of tests among those with severe toxæmia revealed such an excretion. Among normal preg-

Table IV.

A Comparison of the Total Amount of Urea Excreted in Three Hours following a Dose of 15 Grammes of Urea in 100 Cubic Centimetres of Water, with the Urea Concentration and Volume of Urine Secreted.

Type.	Number of Tests.	Percentage Tests in which Excretion of Urea per Three Hours was—										Percentage with Urea Excretion <Four Grms. per Three Hours.	Percentage with Urea Excretion of at least Four Grms. per Three Hours.
		Less than Two Grms. of Urea.	Two to Three Grms. of Urea.	Three to Four Grms. of Urea.	Four to Five Grms. of Urea.	Five to Six Grms. of Urea.	Six to Seven Grms. of Urea.	Seven to Eight Grms. of Urea.	Eight to Nine Grms. of Urea.	Nine to Ten Grms. of Urea.	Ten to Eleven Grms. of Urea.		
1. Normal volume, normal urea concentration	156	—	—	7·7	31·4	33·3	16·7	7·7	1·3	1·3	0·6	7·7	92·3
2. Normal volume, low urea concentration	107	0·4	29·2	38·7	19·8	0·9	—	—	—	—	—	78·0	21·0
3. Small volume, low urea concentration	114	44·7	42·1	13·1	—	—	—	—	—	—	—	100·0	0
4. Small volume, normal urea concentration	206	4·4	24·8	35·1	23·9	9·8	1·5	0·5	—	—	—	64·3	35·7
5. Large volume, low urea concentration	115	4·4	16·7	20·9	27·8	20·9	6·7	3·5	—	—	—	42·0	58·0
Total	698												

nant women 95% showed an excretion of more than three grammes in three hours. Further, in the mild toxæmias 93% of tests revealed an excretion of urea of at least two grammes per three hours, whilst the urea excretion reached at least two grammes in three hours in only 78% of the tests



GRAPH I.

A comparison between the percentage tests and the excretion of urea per three hours following ingestion of 15 grammes of urea in (*a*) normal prgenancy, (*b*) mild toxæmias of pregnancy, (*c*) severe toxæmias of pregnancy.

among the severe toxæmias. Since the severe toxæmias seem to be associated with a lower total excretion of urea it is reasonable to conclude that decreased excretion of urea in three hours after ingestion of 15 grammes of urea indicates renal inefficiency.

Incidence of Patients in whom Tests with Poor Concentrating Power followed those in which Normal Concentrating Power was associated with Low Excretion of Urea in Three Hours.

In 13 of the 51 patients whose urea concentration tests revealed normal concentrating power with low total excretion of urea in three hours, later tests indicated renal inefficiency by low concentrating power.

Low concentrating power was observed in a test later in the *ante partum* period in three patients. The toxæmia was severe enough to warrant induction of labour in two patients, and the third was delivered of a macerated fœtus. In seven patients low concentrating power was observed in tests in the puerperium. All suffered from severe albuminuria, one was delivered of a macerated fœtus, and three required induction.

Tests in the puerperium usually give normal results even in severe toxæmia; hence these results in the *ante partum* period, followed by tests definitely indicating renal damage in the puerperium, are significant.

Observations of urea concentration tests in several pregnancies, including at least one test in which normal concentrating power occurred with low total excretion of urea, were made on three patients.

In one patient this combination of normal concentrating power and low total excretion of urea recurred in the *ante partum* period in the third toxæmic pregnancy and was associated with high blood urea. In the puerperium the concentrating power as well as the total excretion was low.

With a second patient normal concentrating power with low total urea excretion recurred in the *ante partum* period in a second toxæmia, and this progressed to a concentrating power of less than 1% in the puerperium.

In a third patient two recurrent toxæmias were observed in which normal concentrating power occurred with low total excretion. The clinical condition between the second and third pregnancies left no doubt as to the presence of severe renal damage. In the third pregnancy severe toxæmia was evident at eighteen weeks, and two tests exhibited normal concentrating power with low total excretion of urea. After hysterectomy a concentrating power of 2·3% with an excretion of only 15 cubic centimetres of urine for the hour was noted, and the total excretion of urea was 1·3 grammes in 74 cubic centimetres of urine in three hours.

Comparison of Blood Urea and Fowweather Tests with the Modified Urea Concentration Test.

An attempt has been made to correlate the urea excretion in three hours with blood urea and Fowweather tests in patients with mild and severe toxæmias of pregnancy in cases in which, in spite of normal concentrating power, the total urea excretion is low.

In 4% of patients with mild toxæmia and 29% of patients with severe toxæmia in whom such urea concentration tests were made, the blood urea was high (Table VI). Normal blood urea is maintained as long as one-quarter of the total kidney substance is functioning. Hence, since there is agreement between the high blood urea and decreased excretion of urea in three hours in nearly one-third of the cases of severe toxæmia in spite of the normal concentrating power, one concludes that decreased urea excretion in three hours is a measure of renal inefficiency. In patients with normal blood urea, and particularly if there are symptoms such as albuminuria, œdema, raised blood pressure or eye changes, the decreased total urea excretion must surely be interpreted as an indication of renal inefficiency not so gross as to cause high blood urea.

Twenty-one *per centum* of patients with mild toxæmia and 47% with severe toxæmia had Fowweather clearance tests below normal (Table VII), indicating renal inefficiency, and were in agreement with low total excretion of urea in cases in which the urea concentrating power was normal,

TABLE VI.

Incidence of Abnormal Blood Urea Tests in the Group of Patients having Normal Concentrating Power but Small Excretion of Urine.

Blood Urea.	Mild Toxæmia.		Severe Toxæmia.		Total Tests.	
	Number.	Percentage.	Number.	Percentage.	Number.	Percentage.
Normal	25	96	20	71	45	83
High	1	4	8	29	9	17
Total	26	100	28	100	54	100

TABLE VII.

Incidence of Abnormal Fowweather Tests in the Group of Patients having Normal Concentrating Power but Small Excretion of Urine.

Fowweather Clearance Test.	Mild Toxæmia.		Severe Toxæmia.		Total Tests.	
	Number.	Percentage.	Number.	Percentage.	Number.	Percentage.
Normal	11	79	9	53	20	65
Low	3	21	8	47	11	36
Total	14	100	17	100	31	101

This evidence further supports the contention that the total urea excretion in three hours is a more reliable indication of kidney efficiency than the concentrating power.

Incidence of Urea Concentration Tests in which Normal Concentrating Power in association with Low Total Excretion of Urea was noted in Publications by other Observers.

In a series of urea concentration tests in which total excretion of urea in three hours was reported by Cruickshank, Hewitt and Couper,[8] there were 28 tests in a series of 220 in which normal concentration was found with low total excretion of urea.

The tests in the normal control group of 39 patients included five tests of this type. Since no details of previous history were reported, no comment can be made on the reason for such tests occurring in the normal group. Among the 181 toxæmic patients, 23 tests (that is, 12·3%) of the above type were noted. In all cases œdema and albumin were observed, and many patients had symptoms such as headache, backache, impaired vision, vomiting and giddiness. High blood pressure occurred in several patients. Three patients had had severe scarlet fever as children. Two patients were each delivered of a macerated fœtus. Another patient, who suffered from severe scarlet fever with renal involvement at fourteen years and had had two pregnancies resulting in stillborn babies, died after delivery.

Occurrence of this Type of Urea Concentration Test in Non-Pregnant Nephritic Patients.

That this fallacy of assessing renal efficiency by normal concentrating power, in association with low total excretion of urea, may occur in nephritis not associated with pregnancy, is indicated by the following analysis of seventy cases diagnosed as nephritis. In 25 urea concentration tests (36%) in this group the volume of urine secreted in two hours was less than 150 cubic centimetres. In 14 of these 25 tests (20% of the total cases) both volume and urea concentrating power were low; in five tests (7%) the urea concentrating power and the total excretion of urea were normal; in the remaining six tests (9% of the total tests), however, the concentrating power was normal, but the total excretion of urea was low. In each of these six cases the blood urea was 40 milligrammes per 100 cubic centimetres of blood or higher, and all the patients were definitely nephritic.

Discussion.

Although the urea concentration test has proved a valuable means of detecting renal efficiency in nephritic conditions, normal results to tests are frequently found in patients diagnosed as nephritic.

In a series of seventy such patients, 9% of the tests revealed normal concentrating power associated with low excretion of urea in three hours following the ingestion of 15 grammes of urea. That the kidneys were not functioning normally in these cases was proved by the high blood urea in each patient.

Among women with normal and toxæmic pregnancy this type of urea concentration test was found in 9% of the tests performed. In the series of 65 such tests, 77% occurred in prolonged or severe toxæmias in which clinical evidence suggested renal damage. Investigation of blood urea showed that 29% of patients in this group with severe toxæmia, and 4% of those with mild toxæmia had lesions of sufficient magnitude to cause increase in blood urea concentration.

The results of 47% of Fowweather clearance tests on patients in the group with severe toxæmia and of 21% of tests on those with mild toxæmia were below the normal value of 70% average normal clearance.

The incidence of high blood urea and of low results to the Fowweather clearance tests proves

that there was considerable kidney involvement in many of these patients.

It has also been shown that in general there is a very low excretion of urea in three hours among the more severely toxæmic patients in the group. Of patients with this type of urea concentration test, 20% showed low concentrating power as well as low total excretion of urea in tests later in the *ante partum* period or in the *post partum* period. In three cases of recurrent toxæmia this type of test was observed in more than one pregnancy, and in two of these patients low concentrating power as well as low excretion of urea was observed in the puerperium. Most of these patients were severely toxæmic and in several labour was induced.

Analysis of the results published by Cruickshank, Hewitt and Couper showed an incidence of 12·3% of results to tests of this type, and the clinical evidence supported the contention that the low total excretion of urea indicated renal inefficiency. Their tests were made during a period of starvation, whereas those discussed in this paper were made while the patient was on light diet, food and fluid being prohibited for six hours prior to the test. The correspondence in the number of such results to urea concentration tests, performed under the entirely different conditions in these two sets of observations, stresses the necessity for estimating the total excretion of urea when determining renal efficiency when normal concentrating power is associated with small excretion of urine.

A study of the history of M.H. (Table VIII) is interesting in regard to the fallacy of using concentrating power as the indication of renal efficiency tests when the concentrating power is normal but the secretion of urine is small.

In 1928 the patient had a pregnancy complicated by marked toxæmia, œdema, pronounced albuminuria and high blood pressure being observed. The urea concentration was 2·5% and the blood urea somewhat high. Because of the clinical condition the pregnancy was terminated. The patient recovered, but on her discharge from hospital the urine still contained a trace of albumin.

In 1932 the patient was admitted to hospital in a severely toxæmic state with pronounced albuminuria and high blood pressure. Eliminative treatment failed to improve her condition, the urea concentrating power was poor, and again the pregnancy was terminated. She was delivered of a stillborn babe. Twelve days later the renal function tests gave normal results, and a test seven months later showed apparently a complete recovery of kidney function.

In 1933 the patient was again admitted to hospital with toxæmia. The urea concentrating power was fairly good (2·2%), but the excretion of urea was only 2·1 grammes in three hours. She was subjected to eliminative treatment; the symptoms cleared up, but the albuminuria and high blood pressure persisted. Seven days later the concentrating power of the kidneys was normal, being 3% and over in two specimens, but the urea excretion for three hours was only 1·9 grammes. The blood urea content was 52 milligrammes *per centum*. In this group of tests the concentrating power was normal, yet the high blood urea content and the clinical state indicated renal damage. It would seem that the excretion in three hours was the more reliable indication of the condition of the kidney. Following induction of labour the albuminuria and blood pressure gradually became less, and tests after three

TABLE VIII.

Date.	Blood Urea in Milligrammes per 100 Cubic Centimetres of Blood.	Urea Concentration Test. 1. Percentage of Urea.	2. Percentage of Urea.	3. Percentage of Urea.	Grammes of Urea per Three Hours.	Total Volume per Three Hours In Cubic Centimetres.	Clinical History. (No evidence of previous Renal Damage.)
3/12/28	37	1·5	1·4	2·5	Not recorded.		Œdema of legs for two months. Oliguria. Admitted 30/11/28. Albumin 3/4. B.P. 160.[2] Eliminative treatment. B.P. 160. Albumin 3/4. Medical stimulation and termination of pregnancy. Discharged 17/12/28. Trace albumin.
4/5/32	25	0·7 (115)[1]	1·0 (77)	1·3 (38)	2·0	230	Œdema, severe headache, eye signs for two weeks. Admitted 2/5/32. Albumin solid. B.P. 180. Eliminative treatment. Clinical condition worse, Albumin 3/4. B.P. 170. Induced (rectal tubes). Delivered of stillborn babe. 5/5/32: Albumin solid. B.P. 160. 6/5/32: Albumin 1/8. B.P. 160. 8/5/32: Albumin trace. B.P. 180. 9/5/32: Albumin clear. B.P. 130.
16/5/32	—	2·8 (114)	1·6 (74)	1·2 (90)	5·3	278	
12/12/32	—	3·4 (70)	3·5 (73)	3·3 (68)	7·2	211	Recovered.
9/5/33	—	2·2 (56)	1·7 (27)	1·9 (15)	2·1	98	Headache one week, œdema two days. Admitted 8/5/33. Albumin 1/3. B.P. 185. Albumin 1/2. B.P. 180. Eliminative treatment. Albumin 1/6. B.P. 180. 10/5/33: Headache gone, œdema lessening. 10-15/5/33: B.P. always 150-190.
16/5/33	52	3·3 (45)	3·0 (26)	2·3 (24)	1·9	65	19/5/33: Cæsarean section and sterilization. Albumin 3/4 solid. B.P. 170. 23/5/33: Albumin 1/4. B.P. 150. 24/5/33: Albumin 1/6. B.P. 120.
6/6/33	18	1·5 (80)	1·4 (67)	1·7 (59)	3·1	206	Clinical condition good. B.P. fell to 120 and albumin cleared slowly.
23/6/36	—	1·1 (90)	1·0 (70)	1·0 (93)	2·6	253	

[1] Figures in parentheses represent hourly volumes in cubic centimetres.

[2] B.P. = Systolic blood pressure in millimetres of mercury.

weeks revealed a concentrating power of 1·7% with a total excretion of 3·1 grammes. Three weeks later the concentrating power was still low (1·1%) and the excretion of urea was only 2·6 grammes in three hours.

In this case it is evident that the concentrating power (3%) did not give a true measure of renal efficiency. The decreased secretion of urine responsible for this apparently normal concentrating power may be caused by retention of water due to extrarenal influence or to the poor response of a damaged kidney to a diuretic.

Such a diminution in diuresis following ingestion of large volumes of water was observed by McManus, Riley and Janney in normal pregnancy. The writer has already recorded a decrease in the normal secretion of urine following ingestion of 15 grammes of urea in pregnancy, and this diminution being more marked in toxæmic pregnancy. These observations offer an explanation of these urea concentration tests, in which, because of small secretion of urine, the concentrating power is normal but the total excretion of urea is low.

In relation to possible extrarenal factors influencing retention of water and thus increasing the concentration of urea in the urine, the theory of liberation of excess antidiuretic hormone into the blood stream because of over-action of the posterior lobe of the pituitary must not be overlooked.

Since the observation by Van den Velden[9] in 1913, that after subcutaneous injection of extract of the posterior lobe of the pituitary there was an inhibition of the diuresis following ingestion of a large volume of water, much interesting work has been done on the influence of the hormones of the posterior pituitary gland.

In 1929 Verney[10] put forward the hypothesis of an antidiuretic hormone of the pituitary being constantly secreted into the blood, enabling the formation of urine of greater molecular concentration than that of plasma. It has also been shown that if the pituitary is cut out of the circulation, the kidney cannot secrete concentrated urine.

It has been suggested[11] that since hyperplasia of the anterior lobe of the pituitary is present in pregnancy there could be a similar involvement of the posterior lobe, resulting in excessive production of the hormone of this lobe, the antidiuretic component causing retention of water and œdema, whilst the pressor component would account for raised blood pressure.

Anselmino, Hoffmann and Kennedy[12] claim to have obtained a preparation from the blood of women with eclampsia and toxic albuminuria having the property of inhibiting diuresis and increasing urinary chloride, exhibiting pressor effects and showing similar physical and chemical characteristics to those of the posterior pituitary extract.

Hurwitz and Bullock[13] and Byrom and Wilson[14] failed to isolate this component from the blood of eclamptics and preeclamptics, and Byrom and Wilson concluded that if the antidiuretic principle does exist, it is present in smaller amounts than was indicated by Anselmino, Hoffmann and Kennedy.

Should later investigation prove conclusively the existence of such an anti-diuretic principle in the blood in pregnancy, the finding would not be incompatible with these observations of decreased secretion of urine following ingestion of urea in pregnancy resulting in normal concentration of urea in many cases of kidney inefficiency.

The necessity for interpreting the MacLean urea concentration test in terms of total excretion of urea over the period of the test, rather than by the highest percentage excretion of urea per hour in tests where diminished secretion of urine was present, would be confirmed.

Conclusion.

In toxæmias of pregnancy a fallacy is introduced in the interpretation of MacLean's urea concentration test as the "concentrating power of the kidney" in certain instances where only small volumes of urine are secreted. This diminished secretion results frequently in a normal or high concentrating power being obtained, where there is other evidence of marked renal inefficiency. In such cases the excretion of urea in three hours is a more reliable indication of renal efficiency, and MacLean's statement,[15] that the higher the concentration, the more effective the renal function, does not hold. The effects observed may be due to the damaged kidney being unable to give a normal response to a diuretic or to the action of an antidiuretic hormone preventing the normal diuresis following ingestion of urea.

Summary.

1. The diuresis observed following ingestion of urea in normal non-pregnant women and in women eight days after delivery is contrasted with the diminished diuresis in normal and toxæmic pregnancy. This observation is compared with the diminished diuresis following ingestion of a large volume of water in similar patients noted by McManus, Riley and Janney.

2. The normal total excretion of urea in three hours in the urea concentration test is determined from an analysis of 698 urea concentration tests on pregnant women.

3. A comparison of the total excretion of urea in three hours in cases in which, in spite of normal concentrating power, the total excretion of urea is low, with blood urea and Fowweather tests indicates its importance in assessing renal efficiency.

4. That tests may reveal low concentrating power and low total excretion of urea, following normal concentrating power with low total excretion, later in the pregnancy, in the puerperium and in recurrent toxæmias, is further confirmation that the concentrating power provides a less accurate measure of renal efficiency than the total excretion of urea in three hours.

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SOME FURTHER RESULTS OF SHORT WAVE THERAPY.

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IN consequence of the fact that short wave therapy is now becoming an extremely well-known and frequently used method of treatment, it appears that many members of the medical profession may be interested in the following reports of a few typical cases from the author's practice.

Several references have been made to cases in an earlier series, published in this journal in June, 1936, about which later progress notes have lately come to hand. These references will perhaps be appreciated by those who have read the article referred to, and may serve to allay some of the doubt originally entertained regarding the permanent nature of the improvement in certain conditions.

Case I is of perhaps more than usual interest, in that it allows comparison to be made between two methods of treatment.

The patient had suffered from frequent colds for many years. A spasmodic cough was noticed at times and physical and radiological examination of the chest disclosed a perihilar and basal fibrosis, which was of the type frequently found in connexion with an upper respiratory infective process.

Antral radiography revealed severe mucosal thickening on both sides. After a number of different remedies had been unsuccessfully applied, an attempt was made to treat the paranasal condition by means of the conventional or long-wave type of diathermy. Approximately fourteen applications appear to have been made, and it was noted that no alteration, either in signs or symptoms, ensued.

A course of short wave therapy was then administered, with the result that symptomatic relief could be observed almost immediately. The improvement was steadily progressive in nature, and soon definite clinical signs were demonstrable. These consisted of a gradual lessening of nasal discharge and of blocking after an initial slight increase.

The routine X ray film taken after eight applications indicated a satisfactory enlargement of antra and ethmoids. Since the improved aeration was accompanied by marked subjective benefit, no further treatment of this part was given. The disappearance of the cough was considerably hastened by a few applications to the hilar region.

According to a recent progress report, fifteen months after the course, the patient's general health has shown no signs of deterioration, growth of the patient is continuing at its normal rate, colds are not nearly so frequent (when they do occur their severity and duration are much diminished) and the cough has not returned with anything like its previous intensity.

These results need very little comment. They have in fact been duplicated in many other similar cases, and it will therefore be observed that their occurrence is almost to be expected in practically all patients suffering from nasal accessory sinus infection. When operative measures have already been undertaken, the response is, of course, not so rapid, but will nevertheless in most instances be eventually obtained. The latter point may be illustrated by a case recently treated.

The symptoms were those of bilaterel antritis, which was more pronounced on the left side. A radical operation had been performed on the right antrum many years previously. Treatment had to be very prolonged before the radiographs showed the required improvement, but after twelve applications, commencing resolution could be demonstrated, and, when a further six had been given, the condition was considered to have improved to such an extent as to justify conclusion of the course.

The second case to be described has already been presented (Case VIII in previous report), but is regarded as being worth further discussion in view of the fact that a statement as to the patient's condition eight months afterwards is now available. This record indicates that the general health has remained at a satisfactory level ever since the course of short wave therapy was given and that the local pathological lesion has subsided. A short summary of the main features of the case is as follows:

The diagnosis (clinical and radiological) was chronic antral inflammation, with mucosal thickening. The history had lasted for many years. Seven applications were given. Pads were applied side to side, the centre of the pad being one and a half to two inches anterior to the

external auditory meatus. A small initial dose was given (1,600 milliampères for ten minutes), working up to 2,200 milliampères for eighteen minutes at the seventh application. The result was that both the local and general condition was improved. This improvement was found to be maintained both three and eight months later. The illustrations (Figures I and II) show that definite progress has occurred. When the condition reached the stage shown in the second film it was considered that sufficient treatment had been given and that no further therapeutic measures were necessary. The subsequent progress suggests that this opinion was correct.

The condition present in the first film had existed for several years, during which time various therapeutic measures had been applied. The improvement following short wave therapy was not limited to the antra, but apparently included a large portion of the upper respiratory tract, since breathing became very much improved; also the patient's general health immediately showed evidence of a change for the better. Note that the latest progress report of this case, eight months after the treatment, did not suggest any retrogression.

Other cases have also demonstrated the accuracy of estimations based on radiological appearances, and it would seem that this form of control has now become established.

Case III illustrates the disappearance of a pathological effusion. It will be observed in Figures III and IV that the exodus of the fluid has taken place before the mucosal thickening has completely subsided.

In addition to the pathological changes in the antrum there appeared to be a generalized involvement of all the adjacent mucous membranes. The extent of this process was rendered apparent by deafness of recent onset, which, being due to Eustachian catarrh, could be temporarily relieved by insufflation. During the course of short wave treatment the deafness improved and progressive radiographs showed firstly a disappearance of the antral effusion, and secondly a diminution in thickening of the swollen mucous membrane. In this case twelve applications were made, and further improvement occurred after the conclusion of the course.

Irrigations had been administered previously, so rapid progress in the condition of the antral walls was not expected, nor could any immediate benefit paranasally be anticipated in view of the extensive involvement present. The catarrhal obstruction of the Eustachian tubes, however, being in an entirely different category, gave the usual satisfactory response. Case IV was one of infraorbital neuralgia.

The patient gave a history of pain below the left eye dating from an operation on the antra twelve months previously. The pain had been continuous for most of the time and was thought to be steadily becoming more severe. Eight applications were given, the course being interrupted by a short period (of two weeks) in which the patient had a holiday in the country. This interval, however, did not detract from the value of the treatment, since its occurrence was anticipated, and the dosage could then be regulated accordingly.

Results were as follow. During the course a progressive relief of pain occurred. Owing to the projected interval larger doses than usual had to be administered, so there was at times a moderate reaction (headache, slight increase of pain *et cetera*) after some of the applications. The two final applications of the series were particularly intense, as it was hoped that by this means the necessity for further treatment might be avoided. These produced a moderately severe exacerbation, soon after which the desired effect was obtained, the symptoms disappearing completely. Two months later the patient reported absolute freedom from pain since the subsidence of the exacerbation seven weeks previously.

This improvement, occurring in a condition which had given evidence of its presence daily over a period of twelve months, might appear to be so sensational as to be almost unique. But it will be found that this type of response to short wave therapy is quite common. A very similar case has been previously described by the author (Case III of June, 1936, series), and many like it are encountered in the average-sized practice.

The improvement that occurs in catarrhal deafness has already been mentioned (Case III), but is further illustrated by Case V.

The patient, a female, aged about thirty-five years, had been suffering from a generalized naso-pharyngeal catarrh for many years. At times during the previous few months attacks of deafness had taken place, the symptoms being always sudden in onset, and often of quite severe nature. On several occasions the hearing had been temporarily improved by insufflation, but apart from this no local treatment was reported. A course of short wave therapy, eight applications in all, resulted in a complete restoration of hearing, which has not shown any sign of relapsing since the treatment four months ago. Technical details were much as described in Case II, except that the wave length was slightly less, so the milliampèrage could be correspondingly increased without causing any distressing sensation of heat.

This result may be compared with that of Case XX in the series previously reported. In that patient the condition was one of sclerosis in the middle ear, apparently associated with some nerve deafness also. There was no evidence of accompanying Eustachian obstruction, so the lack of improvement was not entirely unexpected. However, a great many cases of deafness, even though the symptoms may be caused by *otitis media* or by a nervous lesion, have an associated catarrhal element, and improvement in the catarrhal condition may be relied upon when short wave therapy is applied. It would therefore appear to be desirable to administer the therapy for a time in all cases of deafness, but after a few applications (six to nine or thereabouts) the catarrhal element, if present, will nearly always respond, and the treatment from then onwards may be chosen according to the clinical findings.

Case VI was one of retinitis on the left side, the condition being disclosed by removal of the lens in the operative treatment of cataract. Very little amelioration was expected, since an extremely grave prognosis had originally been given. Results of short wave therapy were surprising, and excision of the lens on the opposite side, which had previously been considered impracticable, owing firstly to the poor general health, and secondly to the probability of a bilateral distribution of the retinitis, became once more a possibility. In fact, the ultimate prospects of the patient underwent a change for the better, so the rather long course was considered to be entirely justified. Details are as follow.

The symptoms were dimness of vision observed after operation and absence of sight in the opposite eye (owing to developing cataract). The time of onset was not known, but probably was many years before. Seventeen applications were given and the duration of the course was five months. The technique adopted was as follows. On each occasion a small pad was applied over the left

eye, a larger one being placed posteriorly. This arrangement was apparently quite effective, but after the twelfth application the report was so favourable that operative treatment of the other eye was contemplated. Therefore, with the object of hastening the "ripening" process of the right lens, this eye was also placed in the therapeutic field by means of a bifurcated pad anteriorly, and the larger one posteriorly as before. A wave length of twenty-two metres was found to be suitable for this patient, and consequently was adopted for most of the applications. Dosage was small at first (1,800 milliampères for nine minutes), but it was soon observed that the tolerance was sufficiently great to allow a considerably higher dose than this, so 2,500 milliampères were being given at the twelfth application, and a level of 2,800 milliampères was reached finally, the time having been extended to twenty-five minutes.

Visual improvement followed in the left eye, accompanied by a general tonic effect. The influence on the prognosis has already been commented upon, and it seems probable that the retina behind the opaque lens of the right eye has also improved. It is hoped, therefore, that operation on this side will later on be feasible and that the stereoscopic effect thus obtained will be sufficiently good for many years to come.

Comparison with Case III of the series reported in June, 1936, reveals some interesting features. In that patient no retinal response could be demonstrated after eight applications, while in Case VI improvement was shown after seventeen applications. The two records show the advisability of persisting in the treatment of these ocular conditions until a fair trial of the method has been given. Sometimes the premature conclusion of the course is desired by the patient, but often enough there is no barrier of that kind, and the treatment may be administered without interruption.

Case VII exemplifies the response that occurs in tonsillar and peritonsillar inflammation when a course of short wave therapy is administered.

In this instance the condition had been present for some years, and on examination the tonsils were found to be enlarged and ragged. Twelve applications only were given. During the treatment a progressive diminution in size of the tonsils occurred, and pale mucopurulent material, which at first could easily be expressed from the crypts, gradually became less, and finally was not obtainable. At the conclusion of the course no symptoms or local signs could be demonstrated, the adjacent lymph glands (which previously were often swollen and hard) gave no evidence of inflammatory involvement, and the patient noticed improvement in general health and vitality. Some three months after treatment there was no evidence of recurrence.

The value of a method by which disease processes of this nature can be cured without operation is, of course, enormous, and the fact that the buccal and pharyngeal mucous membranes are also included in the therapeutic field makes the treatment even more useful than it would otherwise be, since it naturally follows that a much wider area is treated than that actually occupied by the tonsils themselves.

These cases usually respond quite well to the condenser field between electrodes placed externally (with their central points just behind the angles of the jaw). In certain varieties of tonsillitis the lines of force may be made to converge in the space between the tonsils by means of a metallic ring, sphere or plate held in the patient's mouth; but this modification is not often needed, since equally good results can usually be obtained by the simpler method.

Case VIII was a case of hyperpiesis. No demonstrable cause of the raised blood pressure could be found in kidneys or heart *et cetera*, so the condition was regarded as being one of essential hypertension. Thirteen applications to the cardiac region at approximately weekly intervals caused progressively diminishing readings on the sphygmomanometer, and associated relief of the symptoms which accompanied the increased pressure. At the same time a pulmonary abnorality (bronchitis and possible early bronchiectasis) appeared to resolve completely, and a persistent backache, which had been present for a number of years, was considerably relieved. An improvement in the general health also resulted.

In connexion with this case the response of the bronchial tissues is considered to be worthy of comment. The improvement is nevertheless quite usual and is not confined to conditions such as bronchitis and bronchiectasis, but has also been obtained in many cases of asthma, and of course in the pneumonias (both lobar and lobular) and pulmonary abscess.

Although it is difficult to find a satisfactory and complete explanation of the fact that short wave therapy is effective in reducing abnormally high blood pressure, we can be almost certain that the vascular dilatation plays a large part in the reduction that occurs. This factor is, however, not sufficient to account entirely for the change, and it is in this type of case that the presence of a specific effect must be recognized. When considering cases of abnormal arterial or venous pressure, the reader may profitably bear in mind the fact that short wave therapy is also of value in patients suffering from hypotension. A number of instances are on record in which Addison's disease has been successfully treated by applications to the suprarenal areas, and probably the same will be found to apply to many other conditions associated with a subnormal blood pressure.

In Case IX the patient complained of cardiac pain and dyspnœa, which had been present at intervals for many years (in fact, practically ever since the onset of a mitral lesion about thirty years before). Six applications were given. At each the heart and great vessels were included in the condenser field. Relief of symptoms was almost immediate, and the patient expressed herself as being delighted with the improvement, which surpassed anything that she had previously experienced as the result of various drugs taken from time to time with the object of improving the cardiac musculature and mechanism. The therapy was originally directed to the left hip, which was undergoing treatment for an arthritic condition. Progress here being entirely satisfactory, no interruption was desired, so both parts were treated at each session. After the cardiac symptoms had subsided, short wave therapy was again applied to the hip alone. Weekly intervals between applications appeared to be suitable, and the treatment (which is still continuing) is being carried out on those lines.

This case provides an illustration of the beneficial effects of short wave therapy in certain of the cardio-vascular disorders. If the pain is anginal,

the coronary dilatation is sufficient to account for the improvement and doubtless will explain the majority of the good results reported; but when, as in this patient, a valvular abnormality is present, then something more than a simple increase in the local vascularity would appear to be required, and this additional factor is apparently effectually supplied by short wave therapy.

Case X was one of chronic bronchitis.

The satisfactory response in this condition has already been referred to (Case VIII), but a more gradual improvement than usual was expected in Case X, owing to the age of the patient (over seventy) and the presence of emphysematous changes. However, relief occurred quite promptly, and lessening of the cough was observed soon after the commencement of the course. Nine applications have been given so far, with the result that considerable relief in cough, dyspnœa and improvement in general health have taken place.

In the majority of these applications the electrodes were applied to the basal portions of the lung as well as to the hilar regions, but towards the end of the average course the latter area does not apparently need treatment each time in those patients in whom the signs are at the base, so in the final applications the lower parts were subjected to the maximum concentration, the larger sections of the bronchi being excluded or partially excluded from the field. Treatment of this patient is not yet quite complete, and it is hoped that even further improvement will eventually occur.

Case XI was one of rheumatoid arthritis.

The lesion was considerably advanced in one hip joint, the left, neighbouring articulations being only slightly affected. Typical changes indicating rheumatoid arthritis were present in the X ray film. Response commenced soon after the first three applications and was observed to be gradually progressive. A particularly long course appeared to be advisable; in fact the treatment has not yet been discontinued. An increase in the range of movement is now present, and the pain is not nearly so troublesome, being at times completely absent. The patient is, of course, able to walk much better than formerly and is consequently regarded with surprise by friends and acquaintances. In addition, the general health has improved and several adjacent joints (left sacro-iliac and knee), which were previously painful, now show an improvement which is apparent both clinically and radiologically.

A subsidiary condition of vesical origin in this case appears to be worth recording.

The process, a chronic cystitis of extensive nature, responded to the therapy after a short time and symptomatic relief was soon observed by the patient, who quickly noticed a diminution in the nocturnal frequency of micturition and in the accompanying symptoms.

The response, although gratifying, is by no means uncommon, and may accordingly be expected in a great many cases in which inflammation of the bladder (and sometimes of kidneys also) is present.

Reference to an earlier case (Case XII in the 1936 report) of rheumatoid arthritis may be made here.

In this patient a septic focus had been detected, so treatment was directed to it and to the various joints which were involved. It may be remembered that the immediate results were found to be satisfactory and that there was no recurrence in approximately two months. Since the conclusion of the course sixteen months ago, progress reports at intervals of three months have not indicated relapse.

Case I described at that time also provides interesting evidence regarding the persistence of the improvement in these arthritic conditions. From regular reports made by the patient it appears that no reappearance of the rheumatoid condition has taken place.

Although there are by this time numerous records and statistics indicating the value of short wave therapy in rheumatoid arthritis, it must not be concluded that success is claimed in every case. Some patients who present themselves for treatment do not appear to respond at all satisfactorily to a course which has proved to be effective in others. Admittedly many of these are suffering from a very chronic condition and have already resisted most of the conventional methods used in the management of rheumatoid arthritis, but the fact that they do not improve is, of course, rather disappointing, both to physician and patient. However, it is possible that the number, which is even now quite small, may be further reduced by slight technical alterations and by improvements in the methods used in finding any localized septic focus that may be present. In the meantime, the uncertainty of result in this condition need not deter the short wave therapist who desires to give his patient every possible opportunity of improving. Since there is not in the literature any convincing evidence of permanent aggravation occurring in a case of rheumatoid arthritis or allied disorder as a consequence of short wave therapy, the treatment may be safely applied to almost all patients suffering from the disease.

Case XII was one of osteoarthritis. The response in this condition being as a rule rather gradual, no rapid improvement was expected in the case under consideration. However, progress was a little quicker than usual, and in three weeks definite changes were visible radiographically and were symptomatically apparent to the patient.

The process appeared to be entirely confined to the lateral portion of the transverse carpal articulation, and caused a painful limitation of movement between the trapezium and scaphoid. These bones had the typical sclerosed articular margins of osteoarthritis, and the joint space was seen to be narrowed and irregular. In progressive radiographs during the course of short wave therapy the outlines assumed a sharper, less dense appearance and the space gradually became wider.

After four applications of short wave therapy improvement could be observed radiographically, although the symptoms had not yet undergone anything more than a transient change for the better. As the course proceeded, the range of movement in that part of the hand increased and there was evidence of a gradual subsidence of the slight peri-articular swelling. Meanwhile the pain had become much less and the deep tenderness over the joint had almost disappeared. The X ray film after thirteen applications indicated further improvement. Eighteen applications were given altogether, and three months after the conclusion of treatment the report was satisfactory.

In this instance pads were applied on the dorsal and palmar aspects of the affected part. The wave length was twenty-four metres at the commencement of treatment, then 22, then 15. The dosage was 2,000 milliampères for ten minutes at first, then the dose was increased until 3,000 milliampères were given for twenty minutes at the shorter wave length.

Case XIII was one of sciatica. The records of a patient suffering from this common disorder are being presented, as it is thought that the condition may be of special interest in consequence of the facts that: (*a*) It is of frequent occurrence. (*b*) It is difficult to treat by any of the methods hitherto available. (*c*) The rapid improvement that takes place when short wave therapy is applied to most cases of sciatica is typical of the response usually associated with the treatment when it is directed to localized nervous lesions of similar nature elsewhere in the body.

Five applications were given. After the first of these the pain became much less. Further symptomatic relief then occurred, until after the fourth session no pain at all could be felt. The course could probably have been concluded at that stage, but a further application was desired by the patient, who wished to avoid any possibility of recurrence. A progress report seven months after treatment did not indicate any return of symptoms whatsoever.

For the first pelvic application the electrodes were arranged antero-posteriorly over the sacral plexus of the affected side. A rectangular pad, approximately eight and a half by seven and a half inches, was placed in front of the body with a slightly smaller pad opposite to it, in order that the lines of force might be concentrated in the vicinity of the sciatic nerve. This application was immediately followed by one to the extrapelvic portion of the nerve, the same pads being used, but the smaller pad this time was applied to the lower part of the *gluteus maximus*, with the larger pad anteriorly as before. The second application (on the following day) was likewise made in two directions. After this the extrapelvic application was considered to be sufficient each time, the pads being arranged as previously described. This procedure had to be modified on one occasion, when, owing to the presence of an aching pain in the anterior portion of the thigh, this region was treated in addition to the other part.

A wave length of approximately twenty-two metres was selected for the treatment of this case. It is possible that the response would have been even more rapid with a slightly lower wave length, as in that event a larger dose at each application could have been given without any immediate discomfort. However, for various reasons, the shorter wave was not applied to this patient.

The report concerning another patient may be of interest.

In this case the condition had been present for just over twelve months. Some of the attacks of sciatica were accompanied by lumbago. European spa treatment was successful in overcoming the latter disorder, but the sciatica returned. Short wave therapy was administered on four occasions, the result being complete disappearance of symptoms. Six months later the condition of the patient was reported to be satisfactory and no relapse had occurred since the date of treatment.

Case XIV affords an example of the improvement following short wave therapy when applied to hæmorrhoids.

The patient, an elderly man, had been troubled for some time with rectal prolapse, the condition being associated with piles, which had recently caused considerable disability owing to hæmorrhage. As no evidence of carcinoma could be obtained, symptomatic treatment was indicated. Eight applications of short wave therapy were given and were followed by cessation of bleeding and a consequent improvement in the general health. The first application produced slight exacerbation. (This initial reaction appears to be desirable in most of these cases, but should, of course, be not too severe, as in that event a patient who is already weak from loss of blood may become further debilitated. However, the possibility of an overdose can be readily avoided by the use of suitable factors which can be simply and rapidly calculated.) After the subsidence of the exacerbation steady progress was observed. Seven months after treatment the condition was reported to be still satisfactory, no further gross hæmorrhage having occurred. The prolapse did not appear to have altered appreciably, but was not regarded as being a very important factor in the case.

The abdomino-perineal disposition of the condenser field was adopted, a large electrode being placed above the pubes opposite to a smaller one over the perianal region. For the first application a wave length of over fifteen metres was used. After this a slight reduction was made, but the value was never at any time below ten metres. Dosage commenced at 1,800 milliampères for ten minutes, and increased progressively until at the final application a dose of 2,700 milliampères for eighteen minutes could be given.

This result might seem to be extraordinarily good, but the improvement is really quite usual, and will often be obtained in the short wave treatment of lower abdominal and pelvic conditions to which the piles are merely incidental. In these cases the pathological process is often not at all severe, sometimes not consisting of anything more than a retarded circulation in the hæmorrhoidal loops. Then, of course, the response to short wave therapy is very rapid.

Case XV was one of furunculosis.

In this patient the boils were situated in the buttock and perianal region. Several of them had coalesced and the resultant crater was large and painful. Shortly after the first application the part became much less painful, and that same evening (five hours after the treatment) it was observed that macroscopic improvement had occurred. The second application on the following day resulted in further relief, and after the third and final application two days later no symptoms were present, nor could any surrounding induration be noticed. The abdomino-perineal arrangement of the electrodes used in Case XIV was employed.

Details concerning wave length, current and time are not considered to be very significant in this connexion, since the condition is as a rule quite simple to treat, and responds equally well to various technical combinations.

In connexion with the subject of boils, the mention of those occurring on the face and other parts of the head may be interesting to those reading the article. Short wave therapy has here been followed by excellent results, both cosmetically and pathologically. The proximity of the intracranial vascular sinuses makes surgical treatment undesirable in a great many cases, and most of the other methods do not appear to be completely successful in this situation, so it can be easily understood that a painless and effective method like short wave therapy is exactly what is required in this type of lesion.

Case XVI was one of internal derangement of the knee joint.

In this case a history of pain with repeated attacks of synovial effusion suggested the possibility of one of the varieties of arthritis. The joint was slightly reddened and, of course, very swollen at times (the circumference

just above the knee was eighteen inches; on the sound side at the same level it was 16 inches). Radiographic examination revealed no abnormality, except some localized rarefaction in the substance of the femur and in the posterior portion of the patella (presumably disuse atrophy), and a provisional diagnosis of thickening of the fatty pads was made. The condition responded very rapidly to short wave therapy when used in conjunction with an apparatus designed to prevent complete extension.

After six applications, improvement could be observed in the radiograph, the bone in the rarefied areas having become once more regularly trabeculated and normal in appearance. Improvement was also noticed by the patient, who found that movements were now less painful and had almost regained their original freedom. (Extension, of course, was restricted by the splint, so could not be demonstrated very effectively, but appeared to be much more natural than before treatment.) Also the soft tissue swelling had almost completely subsided, as shown by reduction in the measurement to sixteen and a half inches.

The course was continued for a little longer, to avoid the possibility of relapse, and at the end of the fourth week the therapy was concluded.

Nine applications were given. The size of the electrodes was five by four inches. The position of the electrodes was above the knee, on the outer aspect, to below the knee medially. The wave length was twenty-four metres. The dosage was 1,800 milliampères for nine minutes, increasing to 2,200 milliampères for fourteen minutes at the end of the course. At six months, twelve months and eighteen months after treatment the patient had no symptoms.

It will be observed that often in this series (and in fact in a number of the cases previously reported also) a progressive improvement after the cessation of active treatment has been noted. This characteristic feature of short wave therapy is illustrated in Figure V and sometimes appears to go on for weeks or even months.

The technical factors used were much as described in the earlier report, except that some of the patients were treated at a slightly shorter wave length than the original twenty-four metres. Actually the application appears to be more comfortable and less productive of severe superficial heat at fifteen metres, while certain lesions show evidence of more satisfactory response to the ten-metre wave. Values below this figure cannot be advised for routine purposes, since the effects of the ultra-short waves (less than ten metres) on the deeper structures are rather difficult to estimate.

In no instance should the dosage be in any way excessive. This factor can be automatically controlled by the patient's sensations in most cases when the medium-length wave (ten to thirty metres) and the pad electrodes are used, but subjective indications are not quite so definite when the treatment is being conducted at a lower wave length than this, for at frequencies corresponding to the ultra-short waves cutaneous and subcutaneous heating becomes less prominent and is therefore not so valuable as a guide to the required intensity.

Essential Principles of Short Wave Therapy.

As this form of treatment is not yet thoroughly understood by more than a very few medical practitioners, it is thought that a brief explanation of the fundamental principles of short wave production and action may be of interest. The therapy may be said to owe its discovery and development to the widely known fact that electromagnetic (Hertzian) waves are produced by circuits carrying oscillating currents. This radiation passes out into space at a constant velocity (3×10^{10} centimetres per second), which is the speed of light, X rays and other forms of radiation. If the alternation of the current is sufficiently rapid, a condenser field can be formed in the circuit, and it is by placing the body wholly or partly in this field that the pronounced effects characterizing short wave therapy are obtained. Since the relationship between rate of oscillation of the current and wave length of the electromagnetic waves is constant,[1] the more cumbersome figures indicating the frequency can be replaced by the much simpler wave length values. Thus a frequency of oscillation of 10,000,000 cycles per second may be expressed by the corresponding wave length of 30 metres, and 20,000,000 cycles by 15 metres, and so on. The student must not, however, lose sight of the fact that the condenser field is a very important feature of short wave therapy and that, therefore, exact concentration on the affected part is necessary if the best results are to be obtained by this method. The other constituents of the therapeutic field, namely, the electromagnetic or space waves and the molecular conduction of the heat produced, do not appear to be of nearly as much significance, but are, of course, relatively important factors in the treatment.

The application is usually very simple, no contact between electrode and body surface being necessary or even permissible. Further details concerning this portion of the subject are obtainable from suitable text-books *et cetera*, so the matter need not be enlarged upon here. One point, however, regarding the application may be stressed. This concerns the measurement of current in the circuit containing the patient, and will possibly be of more than usual interest in view of the fact that so many diseased conditions are accompanied by anæsthesia or partial anæsthesia. The sensations, therefore, cannot be depended upon in all cases, so it becomes readily apparent that, whenever the circumstances are at all suggestive of sensory disturbance, the method of regulating dosage by toleration will be unreliable, and it is then that the milliampèremeter in the patient circuit is considered to be essential. The principal effects on the tissues are partly those resulting from heat, which is almost uniformly distributed throughout the part between the condenser plates, and is to some extent conveyed to other regions by thermal conduction and convection. Associated with the heat production is a vasodilatation, which in experimental subjects has been demonstrated chiefly in the capillaries, but which also probably occurs in the larger vessels as well. A great many of the numerous conditions respond-

[1] The relationship is expressed by the equation $V = n\lambda$, where V = velocity of light or other electromagnetic radiation, n = frequency of oscillation, λ = wave length. V being constant, n is constant, that is, λ is inversely proportional to n.

ILLUSTRATIONS TO THE ARTICLE BY DR. R. A. MONEY.

FIGURE II.
Showing the notching in the lipiodol shadow at the level of the fourth lumbar disk, and the extreme narrowing at the level of the fifth lumbar disk.

FIGURE IV.
Showing the lipiodol completely held up in an irregular level opposite the fifth lumbar disk.

FIGURE III.
Showing the diagnostic notching in the shadow of the lipiodol opposite the dislocated disks.

FIGURE V.
Showing that the descent of the lipiodol has been hindered by some object in the vicinity of the fifth lumbar disk, and that it has proceeded further posteriorly than anteriorly. Note the slight notching at the level of the fourth lumbar disk.

ILLUSTRATIONS TO THE ARTICLE BY DR. K. R. SPEEDING.

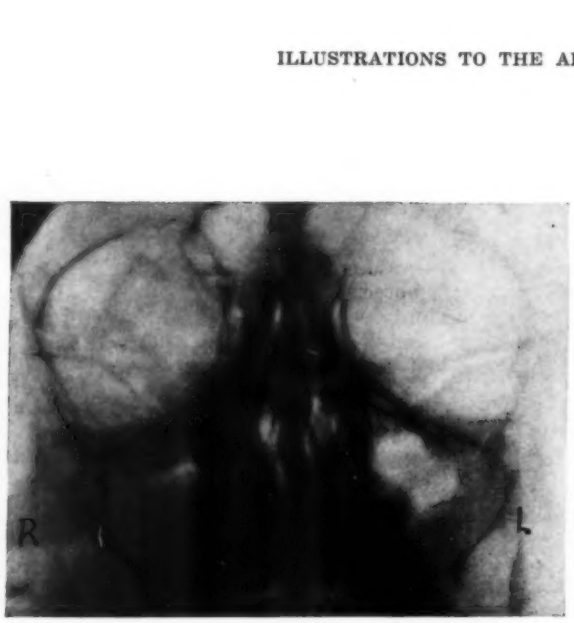

FIGURE I.
Chronic mucosal hypertrophy of antra. Before treatment.

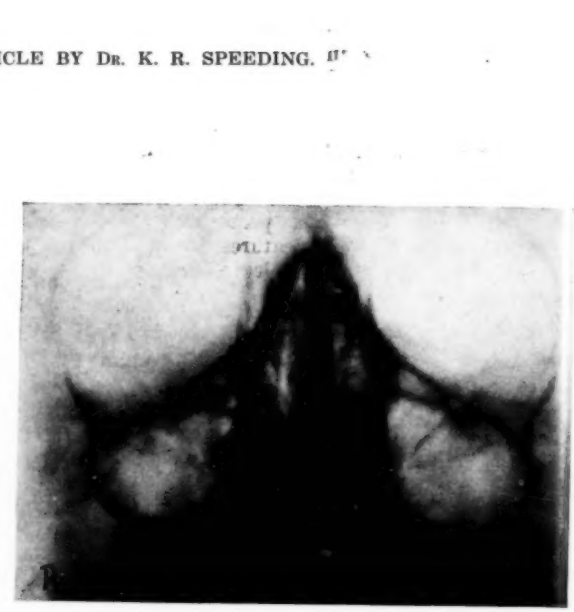

FIGURE II.
Chronic mucosal hypertrophy of antra. After treatment.

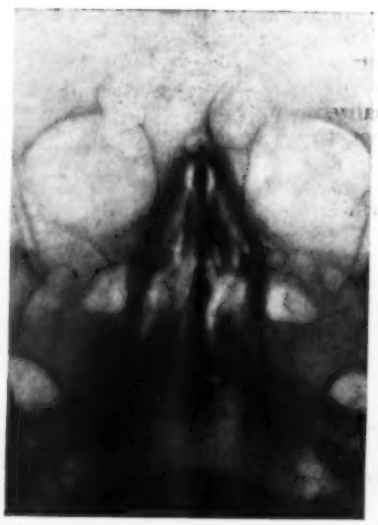

FIGURE III.
Before short wave therapy. Effusion is present in both antra, as indicated by the horizontal level. In those parts of each antrum not occupied by fluid mucosal thickening is visible.

FIGURE IV.
One month after conclusion of course. The fluid has now disappeared, revealing the hypertrophied mucous membrane.

FIGURE V.
Same patient five months after conclusion of course. No treatment whatsoever since short wave therapy. The mucosal hypertrophy is now considerably diminished, the right antrum being almost normal, and the left, which was very much affected in this patient, being greatly improved.

ing to short wave therapy can doubtless be accounted for when this circulatory improvement is borne in mind, and a considerable number of the claims of earlier workers will probably be accepted with less misgiving in the light of these recent experimental findings. In addition to the generation of heat, certain specific effects have been observed. These are often of considerable importance, and include among them physical, chemical, biological and antibacterial actions ranging from changes of rather doubtful significance, such as diminution of serum calcium, increased permeability of vessel walls *et cetera*, to those features whose occurrence is more readily demonstrable in the average case and whose recognition requires no special apparatus. Examples are to be found in many common disorders, of which a few may be mentioned at random. Very striking are the visible changes in connexion with a boil or a carbuncle. Here the rapid diminution in the surrounding induration under the influence of the therapy has only to be seen once or twice to make a definite impression on the observer's mind, and when it is realized that in most cases the resolution is accompanied by an almost immediate relief of pain, the superiority of short wave therapy in the treatment of this type of lesion becomes quite apparent.

Almost equally convincing is the behaviour of large and small pleural effusions, absorption of which usually commences soon after the initial application. Other processes in which the response is easily detected include catarrhal conditions of the nasal accessory sinuses, many cases of lumbago, various circulatory abnormalities *et cetera*.

By many medical men and other observers, especially those who have so far been unable to spend more than a very small portion of their time in study of the matter, short wave therapy is thought to be just a minor variation of long wave diathermy. This view unfortunately considerably restricts the field in which the more powerful short wave therapy would otherwise be used, since there are, as is well known, a number of contraindications to long wave diathermy. The fact that there are many points of difference between the two methods has been, of course, repeatedly and convincingly demonstrated by various authorities, and is suggested clinically when a case (such as Case I) responds to one and not to the other.

The diseases in which short wave therapy is indicated are extremely numerous. Since experimental and clinical work during the last decade has shown that there are not many contraindications, it would appear that short wave therapy may be applied in practically all inflammatory and degenerative conditions, provided that a few simple precautions are observed. Such a wide range cannot be advocated for any other form of therapy, so it is apparent that the method is one the importance of which is almost incalculable and which will undoubtedly exert a profound influence on medical treatment of the future.

It is hoped that the report may be interesting to all those concerned in the investigation of this very promising departure from the conventional medical and surgical methods. The information will possibly be more beneficial if this and the earlier series are compared. It will then be found that some of the results, the permanence of which seemed at the time to be most unlikely, have actually persisted. The interval between the two reports, being purposely more than twelve months, is considered to be sufficient to enable several useful deductions to be drawn concerning a subject the merits of which have so far been rather imperfectly recognized, but the value of which must inevitably become widely appreciated. The policy of selecting the more commonly occurring type of case for the report has been once again adopted, since information regarding these would appear to be much more valuable than would a number of results (however good they might be) of the treatment of rare diseases.

In most of the cases reported treatment has been carried out by units produced by F. W. Bowker and Company. These machines have proved reliable and efficient.

DISLOCATION OF INTERVERTEBRAL DISKS.[1]

By R. A. Money,
Sydney.

Ætiology and Pathology.

The intervertebral disks have been evolved ontologically to act as shock absorbers against the exceptional stresses and strains to which man's spinal column has been exposed since the assumption of the erect posture. Placed between each pair of vertebræ, they allow maximum suppleness and have a highly specialized structure. Anatomically, each disk is composed of three parts: (i) two cartilaginous plates, adapted to the upper and lower surfaces of the adjacent vertebral bodies; (ii) the *annulus fibrosus*, which encloses (iii) the *nucleus pulposus*; this really represents the remains of the notochord.

When the spinal column is subjected to stress, the disk bulges in all directions; but normally, when the force has ceased operating, it returns to its former position, where it is maintained principally by the anterior and posterior longitudinal ligaments. Following some trauma or unusual stress or strain, the *nucleus pulposus*, or even portion of the disk itself, may be extruded beyond its normal limits and fail to return. Such trauma may be the result of direct violence to the spine, such as that produced by a falling object; or of indirect violence produced by lifting heavy objects or by falling from a height and landing onto the feet or buttocks. Sudden twists and wricks produced by slipping

[1] Read at the eighth annual meeting of the Royal Prince Alfred Hospital Medical Officers' Association, October, 1937.

on a wet surface may be sufficient to initiate the dislocation by rupturing the posterior longitudinal ligament. At first, only the soft *nucleus pulposus* herniates; later it may become vascularized from the spongiosa of the adjacent vertebral body, and undergo calcification or ossification; or even portions of the cartilaginous plates become dislocated.

The importance of the lesion in industrial medicine and the compensation courts is at once obvious, although many cases have occurred without any definite history of trauma at all. Recently cases have been reported by Pease following injury to the posterior longitudinal ligament and *annulus fibrosus* at lumbar puncture. In view of the frequency with which lumbar puncture is now carried out, this occurrence calls for extreme caution in its performance. A patient with a verified blood vessel tumour of the cerebellum is at present under observation for a persistent right-sided lumbar and sciatic pain, which originally occurred at the patient's initial lumbar puncture, and which has resisted all forms of treatment. Further investigations by the reversed Queckenstedt test and injection of lipiodol suggest the presence of a dislocated *nucleus pulposus* between the fourth and fifth lumbar vertebræ. The cerebellar condition is now satisfactory, and exploratory operation by laminectomy will probably be undertaken shortly.

History.

Although this subject has become widely recognized and been extensively discussed in the literature only during the last three or four years, as long ago as 1896 Kocher reported a case of rupture of the intervertebral disk between the first and second lumbar vertebræ in a man who succumbed to injuries received after falling a hundred feet and landing in the upright position. This was one of the first cases to arouse interest in intervertebral disk lesions. Since then numerous cases have been described in which the spinal cord or *corda equina* has been compressed anteriorly by what have been regarded variously as chondromata of the disks, fibromata, loose cartilages, fibrochondromata and Schmorl's "nodules". Since the publication of Schmorl's work on the pathology of the intervertebral disks, a number of the earlier and obscure conditions have been correlated and have been given a definite place in diseases of the spine; it is highly probable that most of them have been in reality examples of disk herniations, in which the extruded *nucleus pulposus* has undergone secondary changes. In fact it is now thought by many that the first case of spinal cord tumour successfully removed by Victor Horsley was probably one of these dislocated disks. Their prevalence and importance were revived by Minter and Barr, of Boston, who reported 19 cases in 1934. In 1935 Minter and Ayer recorded a total of 33 cases; and up till June, 1937, the neurosurgical department of the Mayo Clinic had successfully dealt with 54 cases at operation. Numerous other papers, including several dealing with the radiological aspects of the cases, have since been published (*vide* bibliography).

Symptoms and Signs.

The chief complaint is always pain, and it has usually existed for many years and resisted all forms of treatment. The protrusion may occur at any level of the movable part of the spinal column; but by far the commonest situation for its occurrence is in the lower lumbar region, between the fourth and fifth lumbar vertebræ. After that comes the lower cervical region and then the mid-thoracic. Thus in practically every case there is intractable "low back pain" and "sciatica", usually unilateral. This pain may be increased by sneezing, coughing and straining at stool. It may not be continuous, but recurs in attacks. Most of the patients have been the happy hunting ground for the urologist, gynæcologist, orthopædist and general physician, before the true condition is detected. Recognition is not easy, and can often be brought about only by having its possibility constantly in mind. It is made harder by the paucity of clinical signs, especially those of an intraspinal lesion, except in late cases, in which irreparable damage may have already been done by compression of nervous tissue. A diminished or absent ankle jerk may frequently be elicited and also a positive Lasègue's sign (that is, pain on straight leg raising). Patchy sensory changes and muscle weakness are rare, and so are sphincter disturbances, except in advanced and long-standing cases (*vide* Case II).

Diagnosis.

The diagnosis must be made from all causes of low back pain and sciatica, and is generally dependent upon special methods, laboratory and radiological examinations. Plain skiagrams of the spinal column may disclose a narrowed intervertebral space or alteration of the articular facets, suggesting an extruded disk, but most cases occur without any such evidence. Lumbar puncture, if performed at the fourth lumbar space, is usually above the level of the extrusion and will fail to reveal any block to the ordinary Queckenstedt test; if puncture is performed below the extrusion, however, an incomplete block can generally be demonstrated. The total protein content of the cerebro-spinal fluid is usually raised, even if withdrawn from above the lesion, and varies between 40 and 200 milligrammes per 100 cubic centimetres. Cases have been reported, however, with normal protein content in the cerebro-spinal fluid.

Associated with lumbar puncture, a special test for protruded disks in the lower lumbar region has been evolved by Love, of the Mayo Clinic, and is called the reversed Queckenstedt test. A lumbar puncture needle is inserted via the *hiatus sacralis* into the sacral canal as for caudal anæsthesia, and care is taken that it does not enter a vein or an abnormally low *dura mater*. Then another lumbar puncture needle is inserted into the lumbar

sac, between the third and fourth spines, and a manometer is attached. A solution of 1% "Novocain" is then injected by ten cubic centimetre fractions into the sacral epidural space via the caudal needle until about forty to fifty cubic centimetres have been injected. In cases of ordinary sciatic pain, not due to pressure on the nerve roots, the pain is first increased slightly and then relieved completely; and the level of the cerebro-spinal fluid in the manometer rises as the caudal sac is compressed by the epidural solution. If a tumour or protruded disk, sufficiently large to obstruct the lumbar sac, is present, an incomplete increase or no increase in the manometric reading will occur and the block be thus established. Furthermore, as the pressure on the nerve roots is increased, the pain becomes unbearable and the injection will have to be stopped. In some cases the pain may radiate to the opposite limb.

The final diagnosis can be confirmed only by careful fluoroscopic examination and the taking of X ray films in special postures, after the injection of five cubic centimetres (at least) of lipiodol into the subarachnoid space. The selection of patients for this diagnostic procedure is important, as lipiodol should not be injected haphazardly into every patient with sciatica and a backache; but the presence of all or any of the previously mentioned findings calls for its use. The lipiodol may either be injected into the *cisterna magna* and then its descent watched under the screen, or else into the lower lumbar sac and its ascent watched by tilting the patient with his head down. Since protruding disks are situated on the anterior portion of the spinal canal, the maximal filling defect is produced when the patient is lying prone. The block is rarely complete; but if any persistent filling defect is observed, films should be taken as soon as possible without changing the patient's position.

Examination should always include observations made and films exposed with the patient in the prone-oblique and lateral positions, that is, with the rays directed in the transverse horizontal plane. Only by this means can the anterior or antero-lateral position of the mass indenting the column of the radio-opaque oil be accurately demonstrated. The classical filling defect is a sharply defined indentation of the shadow on one side of the mid-line opposite an intervertebral disk, as can be seen in Figures II and III.

Bilateral defects are not uncommon, but complete obstruction of the column of oil is observed only with large protrusions. Multiple defects may be found, indicating multiple protrusions. Significant changes in the shadows of the nerve roots may be seen near the lesion. These are due to œdema of one or more nerve roots, recognized by a broadening of the negative shadow of the root, if outlined, and by displacement or deformity of the shadows of nerve roots within the subarachnoid space. If the oil has extended into the extradural portion of the nerve sheath, deformity of the root may be seen; and in rare cases the shadows may terminate suddenly at the level of the protruded disk. In all cases the lipiodol should be followed along the entire length of the canal, as finding a protruded disk does not exclude a tumour; and two cases have been reported from the Mayo Clinic with both conditions existing simultaneously.

Treatment and Operative Findings.

The only treatment of any avail is the operation of laminectomy and removal of the offending portions of disk or disks, either extradurally or transdurally. Spinal manipulation will tend to increase the herniation and has been known to cause paraplegia; thus osteopaths and chiropractors cannot claim any scope in these cases.

After the laminæ of the adjacent vertebræ have been removed and the dura has been carefully exposed, the protruded disk or disks can be readily seen, usually to one side or the other, compressing one or more (usually the fourth and fifth lumbar) nerve roots or the cord or *cauda equina* (see Figure I). The affected nerve roots appear

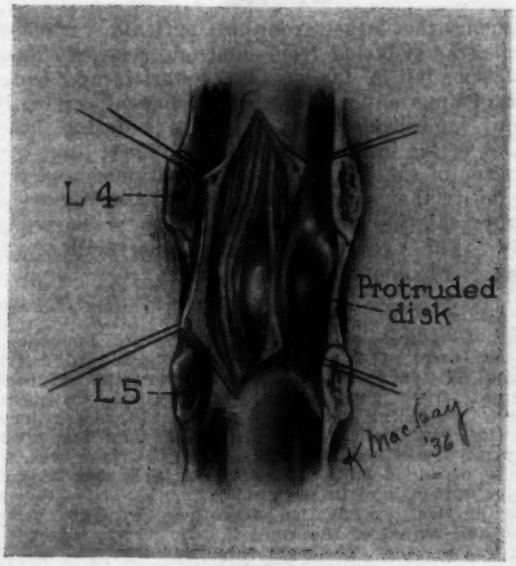

Figure I.
The external and intradural projection of the protruded fourth lumbar intervertebral disk. Marked swelling of the extradural portion of the right fourth lumbar nerve is noteworthy. (From the Mayo Clinic.)

œdematous and swollen if seen inside the dura, whilst extradurally they are considerably elongated and compressed by the abnormal mass. In advanced lesions (*vide* Case II) portions of the disk may be found lying free in the extradural space, behind the posterior longitudinal ligament. Even if the offending protrusions can be dealt with extradurally, the dura and subarachnoid space are generally opened to evacute the lipiodol. An associated lesion sometimes found in these cases is a marked thickening of the *ligamenta flava* of the affected area (personal communication from Professor Naffziger).

Hypertrophy of the *ligamenta flava* causing compression of the lumbo-sacral nerve roots and pain has already been described by Towne and Reichert as a separate clinical entity, with complete relief of pain by laminectomy and their removal.

The results are excellent. The characteristic pains disappear immediately, although a good deal of post-operative pain may be experienced locally from the wound. Lesègue's sign will disappear; full power and sphincter control will be regained; but patchy areas of anæsthesia may persist and the ankle jerk fail to reappear in long-standing cases.

A too early return to ordinary household duties or work should not be allowed, however, until the spinal column has adjusted itself, without undue strain, to the altered conditions and absence of laminæ. In rare cases only will a special support or brace be needed temporarily, whilst spinal fusion may be called for only in very advanced cases with more or less complete dislocation and removal of several disks.

Conclusions.

Among the large group of patients variously labelled as suffering from lumbago, sciatica, fibrositis, spondylitis, lumbo-sacral arthritis and backache of apparent renal or gynæcological origin, it is not improbable that many are suffering from lesions of the intervertebral disks. These cases are the bane of the life of a busy practitioner, and the possibility that special neurosurgical investigations may reveal the cause should always be borne in mind. The two following case reports illustrate many of the above-mentioned points.

Case Reports.

Case I.—A male patient, aged thirty years, complained for two years of right-sided sciatica of classical distribution. The pain was continuous and no relief had been obtained from any medical or physical treatment. Exercise, coughing and straining caused exacerbations. Injections of "Impletol" into the sciatic nerve had given temporary relief for a few hours only. There was no history of any definite injury to his back; but he had always worked hard in the country.

On physical examination tenderness was discovered along the course of the right sciatic nerve. Lasègue's sign was present. The right thigh and leg were wasted and the ankle jerk was absent. The sensations of the foot were dulled. His tonsils were chronically infected. They were removed, but the relief of pain was only temporary, probably owing to rest in bed.

Lumbar puncture yielded normal cerebro-spinal fluid with normal results to Queckenstedt tests. Caudal anæsthesia failed to relieve the pain, and increasing amounts of "Novocain" injected produced exacerbations of the pain.

Plain skiagrams of his spine were normal. Five cubic centimetres of lipiodol were then injected into the *cisterna magna* and its descent was watched under the screen. A definite notching was observed at the level of the disk between the fourth and fifth lumbar vertebræ, and a hold-up at the disk between the fifth lumbar and first sacral vertebræ (see Figure II). Transverse horizontal films taken with the patient lying prone revealed notching in the lipiodol shadow at these sites (see Figure III).

These procedures increased the pain and produced some pain on the left side too. The laminæ of the fourth and fifth lumbar and first sacral vertebræ were removed at operation. The *ligamenta flava* were very thick and hypertrophied. The *nucleus pulposus* of the disk between the fifth lumbar and first sacral vertebræ was found to be dislocated backwards and to the right side, with the first sacral nerve stretched tightly over it; the *nucleus pulposus* of the disk between the fourth and fifth lumbar vertebræ was also dislocated backwards, but not to such a degree. Both were removed.

Convalescence was uneventful and rapid and no further sciatic pain occurred. Some lumbar pain and stiffness followed his first attempts at work, but these have now disappeared with rest, diathermy and graduated exercises.[1]

Case II.—A female patient, aged forty-eight years, about ten years ago had an attack of left-sided sciatica of unknown cause. She was in bed on a splint for about eight weeks and was laid up for nearly a year afterwards. Ever since then her back had been a "weak spot".

About six weeks before being seen she had a bad fall in the laundry and there followed an attack of bilateral low lumbar pain after "something seemed to give" in that region. The pains then spread for four days to the posterior aspect of the left thigh and leg, like a sciatica. They were followed by numbness and peculiarly unpleasant sensations. These paræsthesiæ and numbness spread across both buttocks, over the sacrum and coccyx and around the anus, in the "saddle" area, and finally went down the posterior aspect of the right thigh as far as the knee. She then became unable to walk properly and could get about only by holding onto objects. Her bowels were very constipated, and she had no power in her anal and perineal muscles to help them to act. Finally she was unable to pass urine, although she was conscious of her bladder being full, and it was very painful.

On examination the power in the muscles of the lower limbs was good, although coordinated movements were rather awkward. No wasting had occurred. The plantar reflexes were both flexor; the knee jerks were active, but both the ankle jerks were absent. Some tenderness was elicited over the spinous processes of the fifth lumbar and first sacral vertebræ. Anæsthesia and analgesia were found in the areas of skin supplied by the second, third and fourth sacral nerve roots on each side, and in the area of the first sacral root on the left side (that is, the perineum and saddle area, both buttocks and posterior aspect of both thighs, and the posterior aspect of the left leg and sole of the left foot). The rest of the physical examination revealed no abnormality.

Lumbar puncture in the fifth lumbar space was "dry", but in the fourth space clear fluid was obtained with a protein content of 200 milligrammes per 100 cubic centimetres and excess of globulin. No cells were found and the results of the Queckenstedt tests were normal. The reversed Queckenstedt test was not carried out.

Lipiodol was injected at the *cisterna magna* and produced an exacerbation of the pains, as it became completely held up in an irregular line at the level of the lower border of the fifth lumbar vertebra (Figure IV). A transverse horizontal exposure showed that there was a mass anteriorly causing the block and deformity (Figure V).

Laminectomy was performed by removal of the laminæ of the fourth and fifth lumbar and the first sacral vertebræ, together with their thickened *ligamenta flava*. The dura bulged backwards markedly when decompressed. When the dura was rotated several portions of the completely herniated disk between the fifth lumbar and first sacral vertebræ popped out and were easily removed (Figure VI). They appeared to be lying free in the extradural space behind the posterior longitudinal ligaments and compressing the entire *cauda equina* at this level, and particularly the left first sacral root. The dura was opened and the lipiodol was then readily evacuated. The roots of the *cauda equina* appeared very œdematous and unhealthy. The fourth lumbar disk was seen to be prominent, but no definite protrusion was detected.

Convalescence was accompanied by much abdominal distension and post-operative pain, which gradually subsided. Full voluntary control of micturition returned in a week,

[1] This patient was shown at a meeting of the New South Wales Branch of the British Medical Association on June 4, 1937.

but constipation persisted for longer. Normal rectal and anal sense was not regained for several weeks.

Three weeks after operation the patient was able to walk well unaided. The nasty sensations of pressure at the anus and coccyx and the unpleasant numbness in the buttocks and posterior aspect of the left thigh have persisted. She still feels as if she is sitting on an air cushion (twelve weeks after operation) and her back gets stiff if she sits in one position for any length of time. She is free of pain, however, and can walk well and do her ordinary household duties and a little gardening.

FIGURE VI.
Showing completely protruded portions of the intervertebral disk between the fifth lumbar and first sacral vertebræ in Case II.

It is hoped that the numbness and paræsthesiæ will clear up in time, when the nerve fibres regenerate, although fibrosis may have taken place in the neurilemma from persistent pressure and contusion.

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OBSERVATIONS ON THE HEIGHTS AND WEIGHTS AND GROWTH OF PRE-SCHOOL CHILDREN IN THE CITY OF MELBOURNE.

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AND

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THE observations in this paper are based upon the record cards of pre-school children who have attended the city health centres during the years 1932 to 1936 inclusive. All measurements of height and weight have been made by the sisters in charge or by voluntary helpers under their direction. One of us (H.E.K.) has been responsible for the medical examinations and general supervision of the centre work, whilst the statistical compilations have been carried out by the other (M.S.).

During recent years, in which pre-school work in the centres has been developing, special attention has been paid to the growth and nutrition of the children. Medical examinations have been made periodically, and a considerable proportion of the children (20% to 25%) have been classified as malnourished. Malnutrition has been much discussed of late years, and it is evident that different observers have not all had a common standard of measurement of nutrition, so that their results are not comparable.

Of the various methods of assessing nutrition which have been suggested, that which is based upon the relation of weight to height is one of the easiest to use, and Emerson, of Boston, who has used it in his nutrition clinics, is very definite as to its efficacy. He defines his idea of malnutrition clearly. For girls and boys he has a standard weight for every height which he regards as an average. He declares, as the result of experience, that children whose weight is habitually 7% or more below this average show clinical evidence of malnutrition. On the other hand, children whose weights are as much as 20% above the average are regarded as of normal nutrition. Those whose weights are more than 20% above the average are considered abnormal.

Judgements of nutrition made by accurate measurements of height and weight and subsequent comparison with a standard are probably more reliable than those made by clinical observation, although they cannot be regarded as infallible.

Up to the present the procedure here has been to examine a child, to record the opinion formed of its nutrition as judged by firmness, posture, colour *et cetera*, and later to compare this with Emerson's standards of weight for height. There has been a close correspondence between these clinical judgements and the American standards, but the impression has been that the average weights for height were higher and the average heights for age were lower than those given by Emerson. The need for local standards has long been felt, and we have now sufficient material to warrant the attempt to find these. The graphs presented in this paper are compiled from 10,000 records of the height and weight of 2,800 children (1,450 girls and 1,350 boys) between the ages of two and six years who have been in attendance at the pre-school sessions in the centres during the years 1932 to 1936 inclusive. These children live in the city area and are mainly of the unprivileged classes, a large proportion belonging to unemployed families.[1] Attendance at the centres is voluntary, some children being

[1] Racially, only about 7% of the children are not of British stock, the foreign children belonging mainly to the Jewish, Greek and Italian communities.

brought regularly, while others attend only at long and irregular intervals. A majority of the children have been more or less regular centre attendants during their first two years of life, and so, presumably have had fairly satisfactory feeding and routine during their babyhood. The city council supplies sufficient milk (mostly dried) for infants whose parents cannot afford to buy privately, and the experience at the centres is that nutrition and development in the majority of centre attendants is satisfactory up to the end of the first year. A small proportion have not attended a centre at any time during babyhood. Many of the children up to the age of four who attend regularly and whose parents cannot afford to buy milk, are supplied with one pound of dried milk per week from the centres. Children attend more often and more regularly during the third and fourth years than they do during the fifth and sixth. Measurements of height and weight are recorded at each attendance, and a note is made as to general health, appetite, diet, sleep and routine. The boys are measured and weighed in a singlet, the average weight of which is two to three ounces, and the girls are measured and weighed in bloomers, the average weight of which is also two to three ounces. Complete medical examinations are made as frequently as possible. All defects found are recorded, the most common being dental caries, malnutrition, unhealthy conditions of nose and throat, and bony and postural imperfections.

The records were analysed with five main objects in view, namely:

1. To determine the average weight for height, height for age and weight for age of all the centre children irrespective of their physical condition.

2. To determine the average weight for height, height for age and weight for age of those children only who, after medical examination, had been classed as healthy, well-nourished children, with no detectable defects.

3. To see whether the charts obtained from the healthy "no defect" children differed much from those obtained from the average of the whole group.

4. To obtain a graph which would show seasonal variations, if any, of growth in height and weight.

5. To compare the first two series of charts with those compiled from the American averages.

The measurements recorded upon the cards were classified under the two headings "Height for Age" and "Weight for Height". The ages were taken at intervals of a month, from two years to five years and eleven months, and the heights were taken at intervals of a quarter of an inch from thirty-two inches to forty-six and three-quarter inches. The weights were measured in pounds and ounces.

In the classification of the entries the boys and girls were kept separate throughout, as the sexes show a distinct difference in height and weight.

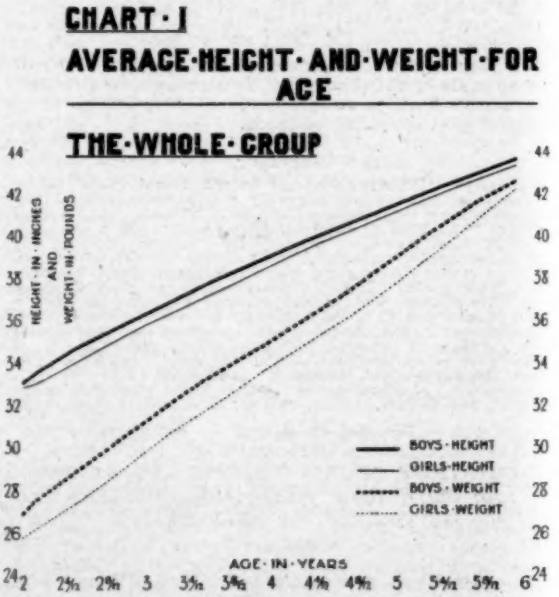
A preliminary study of the record cards showed that the average number of attendances per child per year was three, and it was decided to use not more than this number of entries for any one child in any one year, thus avoiding the undue influence of a child who had been brought to the centre very frequently. This limitation reduced the number of entries used to the 10,000 mentioned above. The selection of the three entries for each year was at random.

Statistical Work.—When the entries were collected and classified, the arithmetic mean of each column was found and graphed, and the graphs were then "smoothed". The method of smoothing was to take the three adjacent intervals above and below a certain entry, adding the seven observations and obtaining the mean. This was done for all the observations in turn (excluding the first and last three, where it had to be modified a little), and the points thus obtained were joined up. A reasonably smooth line was obtained.

Owing to the small number of records of children without defect after the age of five and a quarter years, the curves of these children ceased to be reliable after that age and they were therefore not prolonged beyond that point.

Charts based on the smoothed curves bring out the points which were elicited.

Chart I shows graphs representing average height and weight for age of all the children investigated, irrespective of physical condition. The numbers



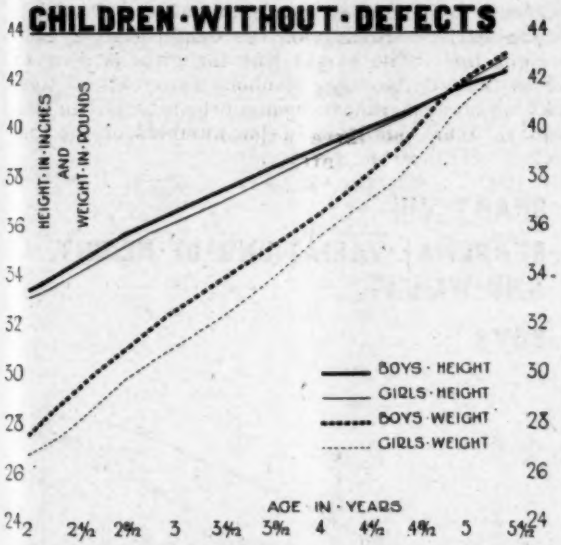
(10,000 records of 2,800 children) were sufficiently large to make it reasonably reliable throughout. The weight for age lines were obtained by reading off from the average lines in Chart IV the weights for the heights belonging to any age.

Chart I shows: (i) The uniformity in the rate of growth both in height and weight and the gradual catching up of the weight curve, which

CHART·II

AVERAGE·HEIGHT·&·WEIGHT·FOR AGE

CHILDREN·WITHOUT·DEFECTS

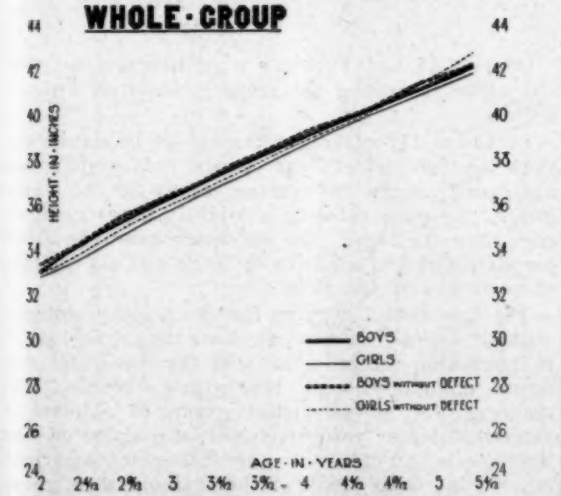


would cross the height curve at about six years. (ii) That the boys are taller and heavier than the girls throughout, though the difference diminishes with advancing age. For example, at two years and four months the boys are about half an inch taller than the girls, and at five years and four months they are about a quarter of an inch taller. At two years and four months the boys are about one and a quarter pounds heavier than the girls,

CHART·III

AVERAGE·HEIGHT·FOR·AGE

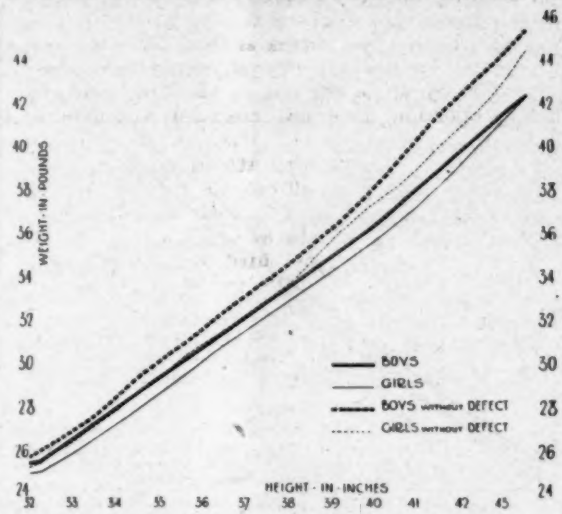
COMPARISON·OF·CHILDREN WITHOUT·DEFECTS·WITH·THE WHOLE·GROUP



CHART·IV

AVERAGE·WEIGHT·FOR·HEIGHT

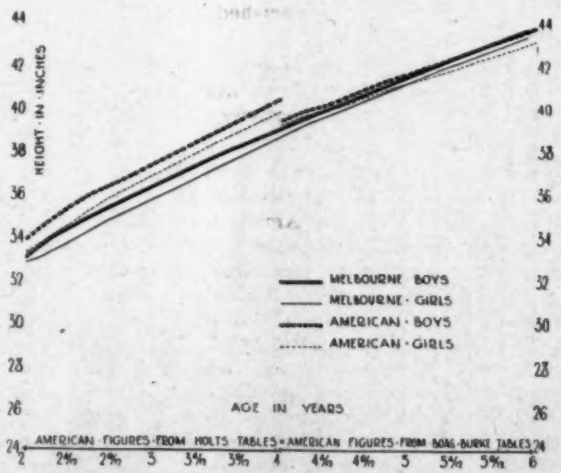
COMPARISON·OF·CHILDREN·WITHOUT DEFECTS·WITH·THE·WHOLE·GROUP



CHART·V

AVERAGE·HEIGHT·FOR·AGE

COMPARISON·WITH·AMERICAN STANDARDS



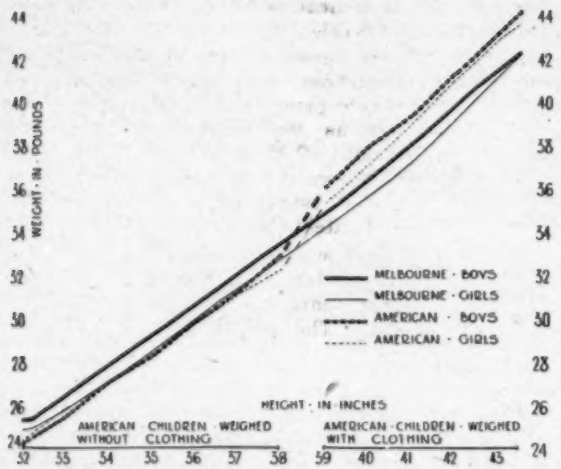
and at five years and four months they are only about three-quarters of a pound heavier.

Chart II is the companion to Chart I, but deals only with the group of children regarded as healthy,

CHART·VI

AVERAGE·WEIGHT·FOR·HEIGHT

COMPARISON·WITH·AMERICAN STANDARDS

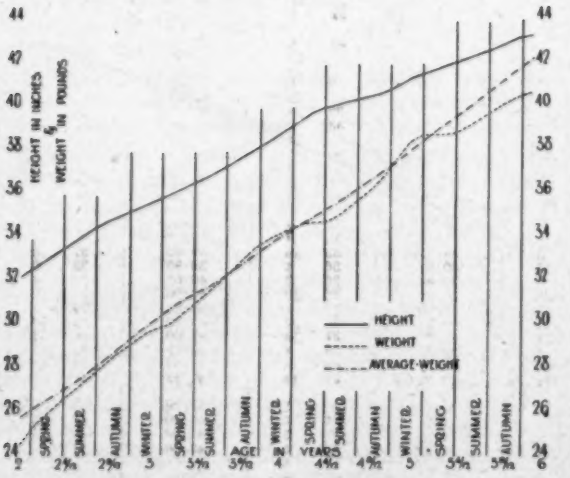

WEIGHT · IN · POUNDS
HEIGHT · IN · INCHES
MELBOURNE · BOYS
MELBOURNE · GIRLS
AMERICAN · BOYS
AMERICAN · GIRLS
AMERICAN · CHILDREN · WEIGHED WITHOUT CLOTHING
AMERICAN · CHILDREN · WEIGHED WITH CLOTHING

well-nourished and without defect (650 children with 2,300 entries). Any defect, even one slightly carious tooth, debarred a child from inclusion.

CHART·VII

SEASONAL·VARIATIONS·OF·HEIGHT AND·WEIGHT

GIRLS



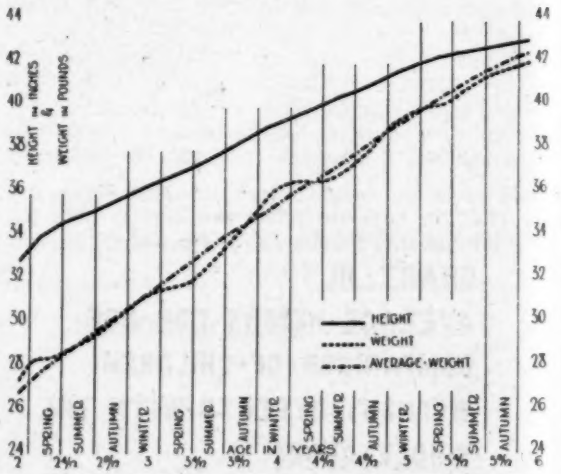
Between the ages of two and three years roughly 36%, and between the ages of four and five roughly 10% of the whole belong to this group. The effect of the smaller numbers here is to make the curves less smooth. The curves have not been extended beyond the age of five and a quarter years, because they were considered to be unreliable beyond that age on account of the smallness of the numbers.

The chart presents on the whole the same features as the first, but with a marked upward trend in weight after four years of age, resulting in an earlier crossing of the height line by the weight line. The height line for girls is seen to cross that of the boys at about five years of age, but too much significance cannot be attached to this owing to the smallness of the numbers of the "no defect" children at this age.

CHART·VIII

SEASONAL·VARIATIONS·OF·HEIGHT AND·WEIGHT

BOYS



Charts III and IV show a comparison between the whole group and the group of children without defects.

In Chart III of height for age it is significant that the "no defect" curves are consistently but not greatly above the average curves for the whole group, the girls showing a slightly greater difference than the boys. The difference averages about one-eighth of an inch with the boys and one-quarter of an inch with the girls.

The fact that the curve for the healthy children without defects is somewhat above the average curve is interesting and is in line with the fact which was noted on analysis of last year's records, that amongst the well-nourished group of children a somewhat larger percentage was of average or over average height for age (according to American standards) than amongst the malnourished group (67% as against 61%).

It appears, therefore, that, whilst a child's attainable height may be determined by heredity, its

attainment is correlated with nutrition and general health. Our figures, however, on the whole indicate that the influence on height of the relative well-being attained by these children is not a very marked one. Height is a variable quality in all the children investigated, as is shown by the tables below, but it is not quite so variable in the "no defect" group as in the whole group. At each of the ages given below the shortest of the non-defective children is taller than the shortest for the whole group, whereas the tallest of the non-defective children is not taller than the tallest of the whole group.

Chart IV, which gives graphs representing weight for height, is probably the most useful one, as the relation between these two measurements does seem to be indicative of the degree of well-being of an individual.

In this chart the curves for the children without defects are throughout well above the average curves for the whole group, the absolute difference becoming greater as the height increases; for example, for a height of 32 inches the difference in weight between the two curves is only about half a pound, whilst for a height of 43 inches the difference is approximately two pounds.

Medical examinations have shown that not only do more children deviate from health in the later than in the earlier years, but that the deviation is more pronounced. The weight for height curves

TABLE I.
Height for Age.

Age in Years.	Whole Group.		Healthy "No Defect" Group.	
	Variation for Girls in Inches.	Variation for Boys in Inches.	Variation for Girls in Inches.	Variation for Boys in Inches.
2	30½ to 36	30½ to 36½	31 to 36	31½ to 36½
3	32½ to 38½	32½ to 38½	33½ to 38½	34½ to 38½
4	34 to 42½	35 to 43	37½ to 41½	37½ to 42½

TABLE II.
Average Height and Weight for Age.
Whole Group and "No Defect" Group. (Charts I, II and III.)

Age.	Girls.				Boys.			
	Whole Group.		"No Defect" Group.		Whole Group.		"No Defect" Group.	
	Height.	Weight.	Height.	Weight.	Height.	Weight.	Height.	Weight.
Yrs. Mths.	Ins.	Lbs. Ozs.	Ins.	Lbs. Ozs.	Ins.	Lbs. Ozs.	Ins.	Lbs. Ozs.
2 0	32·93	25 14	33·13	26 12	33·18	26 14	33·43	27 9
2 1	33·08	26 2	33·28	27 1	33·57	27 8	33·67	28 0
2 2	33·30	26 8	33·51	27 4	33·83	27 13	33·94	28 8
2 3	33·57	26 12	33·83	27 11	34·12	28 3	34·20	28 14
2 4	33·81	27 0	34·08	28 1	34·41	28 8	34·48	29 4
2 5	34·08	27 5	34·36	28 8	34·70	29 0	34·82	29 14
2 6	34·36	27 12	34·67	29 1	34·95	29 4	35·14	30 4
2 7	34·65	28 3	34·93	29 6	35·21	29 9	35·43	30 11
2 8	34·90	28 7	35·23	29 13	35·46	30 0	35·64	31 0
2 9	35·13	28 13	35·46	30 0	35·72	30 5	35·87	31 6
2 10	35·41	29 5	35·70	30 8	35·97	30 11	36·12	31 14
2 11	35·66	29 12	35·94	30 13	36·21	31 1	36·40	32 5
3 0	35·89	30 1	36·15	31 1	36·43	31 6	36·58	32 9
3 1	36·13	30 7	36·35	31 5	36·67	31 12	36·73	32 12
3 2	36·37	30 12	36·63	31 13	36·93	32 2	36·92	33 3
3 3	36·60	31 2	36·83	32 1	37·18	32 8	37·27	33 10
3 4	36·85	31 6	37·10	32 5	37·41	32 13	37·53	33 15
3 5	37·08	31 10	37·37	32 12	37·67	33 3	37·79	34 4
3 6	37·32	31 14	37·58	33 2	37·87	33 7	37·95	34 7
3 7	37·55	32 4	37·81	33 7	38·04	33 11	38·16	34 14
3 8	37·80	32 11	38·07	33 15	38·27	34 1	38·34	35 2
3 9	38·08	33 1	38·29	34 5	38·49	34 5	38·65	35 11
3 10	38·35	33 7	38·61	35 2	38·73	34 9	38·77	35 14
3 11	38·57	33 12	38·75	35 6	38·96	34 13	39·04	36 4
4 0	38·80	34 0	38·96	35 11	39·19	35 3	39·23	36 8
4 1	39·04	34 7	39·21	36 3	39·39	35 9	39·47	37 3
4 2	39·28	34 10	39·42	36 8	39·59	35 14	39·60	37 8
4 3	39·48	35 0	39·55	36 12	39·81	36 4	39·89	38 0
4 4	39·63	35 4	39·81	37 3	39·94	36 7	40·03	38 4
4 5	39·85	35 8	40·03	37 8	40·16	36 12	40·20	38 10
4 6	40·08	35 14	40·32	37 12	40·36	37 1	40·45	39 1
4 7	40·28	36 3	40·57	38 5	40·51	37 7	40·69	39 13
4 8	40·49	36 10	40·81	38 12	40·75	37 14	41·00	40 14
4 9	40·68	36 15	41·18	39 5	40·97	38 4	41·45	41 10
4 10	40·93	37 4	41·58	40 7	41·17	38 8	41·59	41 13
4 11	41·15	37 10	41·75	40 14	41·39	38 14	41·63	41 15
5 0	41·37	38 0	41·99	41 3	41·59	39 3	41·78	42 5
5 1	41·53	38 6	42·35	41 10	41·83	39 12	41·90	42 7
5 2	41·73	38 14	42·53	41 11	42·05	40 3	41·98	42 9
5 3	41·96	39 4	43·16	43 8	42·22	40 5	42·30	43 1
5 4	42·14	39 10			42·42	40 8		
5 5	42·30	39 15			42·58	41 0		
5 6	42·50	40 6			42·81	41 6		
5 7	42·69	40 11			42·97	41 8		
5 8	42·90	41 3			43·13	41 12		
5 9	43·06	41 8			43·34	42 2		
5 10	43·30	42 0			43·57	42 8		
5 11	43·35	42 2			43·72	42 11		

Table III.

Average Weight for Height.

Whole Group and "No Defect" Group. (Chart IV.)

Height in Inches.	Girls.				Boys.			
	Weight.				Weight.			
	Whole Group.		"No Defect" Group.		Whole Group.		"No Defect" Group.	
	Lbs.	Ozs.	Lbs.	Ozs.	Lbs.	Ozs.	Lbs.	Ozs.
32	25	1	25	5	25	8	25	13
32¼	25	0	25	9	25	9	26	3
32½	25	6½	25	15	25	15	26	5
32¾	25	10	26	4	26	5	26	11
33	25	15	26	9	26	9	26	15
33¼	26	7	27	0	27	0	27	4
33½	26	11	27	4	27	7	27	11
33¾	26	15	27	9	27	11	28	2
34	27	4	27	15	28	1	28	11
34¼	27	10	28	5	28	6	28	15
34½	28	0	28	12	28	13	29	5
34¾	28	4½	29	3	29	1	29	12
35	28	9	29	7	29	5	30	2
35¼	29	1	29	13	29	10	30	7
35½	29	8	30	4	30	1	30	12
35¾	29	14	30	9	30	6	31	3
36	30	4	30	14	30	12	31	11
36¼	30	9	31	3	31	2	32	2
36½	30	15	31	9½	31	8	32	7
36¾	31	5	31	15	31	14	32	13
37	31	8	32	4	32	5	33	7
37¼	31	13½	32	9	32	10	33	9
37½	32	3	33	0	32	15	33	14
37¾	32	10	33	5	33	5	34	4
38	32	15½	33	12	33	10	34	8
38¼	33	5	34	3	34	0	35	1
38½	33	11	34	14	34	6	35	8
38¾	33	15	35	6	34	10	35	14
39	34	5	35	12	34	14	36	4
39¼	34	12	36	4	35	5	36	9
39½	35	1	36	11	35	12	37	4
39¾	35	6	37	2	36	3	37	13
40	35	12	37	8	36	9	38	3
40¼	36	2	37	9	36	14	38	12
40½	36	11	38	3	37	6	39	3
40¾	36	15	38	11	37	14	40	0
41	37	5	38	15	38	4	40	14
41¼	37	12½	39	8	38	10	41	3
41½	38	5	40	4	39	1	41	11
41¾	38	14	40	14	39	8	42	4
42	39	6	41	4	40	2	42	10
42¼	39	14	41	10	40	6	43	1
42½	40	6	41	10	40	14	43	0
42¾	40	13	42	2	41	5	43	3
43	41	7	43	0	41	9	—	
43¼	41	14	43	14	41	15	—	
43½	42	6½	44	9	42	6	—	
43¾	42	14½	45	10½	42	12	—	

obtained from the "no defect" group should, therefore, represent a better standard for measuring nutrition than the curves obtained from the average for the whole group which includes all the children whatever their physical condition.

Charts V and VI show a comparison between the figures obtained here and the figures given by Emerson, of America, in tables published in the appendix of his book "Nutrition and Growth in Children". These two charts show the difficulty of using the American figures because of the break in the continuity of the curves.

In Chart V, of height for age, this break occurs at the age of four years, because between the ages of two and four years Emerson has put forward his figures by six months in order to get a "working standard" for normal children. Thus, though at first sight the Melbourne heights compare unfavourably with his, they are in reality not much below, and in fact are slightly above after five years of age.

In Chart VI, of weight for height, it is only the portions between 32 and 38 inches which are strictly comparable, as within those limits both the Melbourne children and the American children were weighed without clothing. In the latter half of the chart the American children were weighed in indoor clothing but without shoes, and as the weight of the clothing might range from a pound to a pound and a half, it is difficult to tell what the real difference would be.

In the earlier half, however, it is plain that the Melbourne children, especially the boys, are slightly heavier, and also that the relation of the weights of the boys and girls is somewhat different. The boys here are consistently heavier than the girls, and by a fairly constant amount, whereas, according to the American figures, the girls are heavier for their height at first, and keep very close to the boys for some time, the two lines diverging slowly after about 37 inches.

Charts VII and VIII give the results of the investigation into the question of seasonal variations in weight and height. The investigation was confined to children born in August, so that the seasons could be easily seen, and also to prevent any other time factor entering into the calculation. The records of approximately 200 children were used. The curves for height of both boys and girls are seen to advance fairly regularly independent of the seasons, but the weight curves of both boys and girls show a distinct wave-like appearance, which, when analysed, indicates that growth in weight is practically stationary during the latter part of winter and the whole of spring, that is, from August to December, and increases rapidly during summer and autumn, that is, from January to July.

In Volume XVI of the proceedings of the Wellington meeting of the Australasian Association for the Advancement of Science in 1923, Dr. Fitt describes his investigation in 1918 of 355 school children attending one of the Melbourne city schools. He found weight increase to be much greater in the first half of the year (March to July) than in the latter half (August to December). Similar findings were given later by Dr. Harvey Sutton in a paper read at Perth. Dr. Fitt queries the possibility of environmental conditions connected with school life affecting the growth curves, and says that "to solve the problem it would be necessary to compare the variations according to season with children who do not go to school at all, with those who attend regularly".

It is interesting to see that the weight curve of the 200 city pre-school children now investigated shows a similar variation in relation to the seasons to that described by Dr. Fitt.

Dr. Jane Greig, in her annual report on school medical inspection in Victoria, 1935-1936, in commenting on the open air school, noted a definite gain in weight in the pupils always in February, March and April.

From the chart it is noticed that the seasonal wave is less marked between two and three years of age than it is later. Infant welfare experience here indicates that growth in weight is fairly

regular during infancy, and it may be that variations due to seasons become more appreciable as age advances.

The suggestion that height increases when weight is stationary receives no confirmation from this small group.

Tables II and III give the average figures from which the graphs of weight for height and height for age were constructed.

Acknowledgement.

We wish to express our thanks to Dr. John Dale, Medical Officer of Health for Melbourne, for his interest and suggestions.

Reviews.

THE ROYAL INFIRMARY OF EDINBURGH.

DR. LOGAN TURNER'S history of the Royal Infirmary of Edinburgh is a fine large book of nearly four hundred pages, full, meticulous and complete.[1] Its compilation has evidently been a labour of love and duty to the great institution in which the author worked long with honour and usefulness. Perhaps in some ways it is larger than was necessary. Too much space is given to the early history of medicine, which is more appropriately told in other works on general medical history. It is, however, quite useful and proper in this work to sketch the rise of the voluntary hospital movement in Britain, and especially apposite to recount the influence and value of the teaching of Scots students in Leiden, at the feet of that great master in medicine, Boerhaave. It was indeed from that strong and fruitful source that the beginnings of medical study, as we now know it, sprang in Scotland.

From that spring of learning came the foundation of the Edinburgh school of medicine, just as in later days, from this same child of Holland spread medical lore and teaching to the colonies in the Western world and, still nearer our present time, to a large extent to Australasia and other dependencies of our far-flung Empire.

The actual birth of the Royal Infirmary dates from a very humble beginning in the year 1729; and the story of its inception then, in Robertson's Close, is told well, fully and sympathetically. Its subsequent growth in size and efficiency, year by year, is described at length, till we see a completed picture of that building in which some Australian practitioners still alive began their studies. It existed indeed till about 1879, when the transfer of its patients and its activities took place to the noble assemblage of pavilions close to the Meadows, then just completed—a building dear to many generations of students and resident medical officers.

Space will not allow us to follow Dr. Turner in his recital of the gradual enlargement and wider scope of work of this great centre of philanthropic service and the training of medical men and nurses. Let it suffice to say that all the steps in which the raiment, that is, the material tenement, of the Royal Infirmary grew, are faithfully set forth. Nor does the author indeed forget to record something of the many generations of distinguished men who have laboured within its walls. We would perhaps that he had strayed more often, and at greater length, from the visible structure, and had written more in intimate fashion of those who worked therein, who made its dry bones live, and who, in their day and generation, gave it a "soul". For there is indeed a soul in a hospital, and some who were nurtured therein and who are disparted by years and distance, turn at the end of their lives more to the men than the masonry of the places of light and learning which they knew in their youth.

It is true that Dr. Turner sometimes more happily lets himself go in biographettes of some of these great men of the past—"alas too few"—we would that he had fallen more often into a pleasant anecdotage, which he could well have done, with a wealth of knowledge not given to those who early left that "dear grey city of the north". This small criticism is made with diffidence and kindly feeling. We would have less of the "raiment", that is, the masonry and the minutes of the managers, and more of the men who adorned the institution. Who, among the students of thirty to sixty years ago, can forget the personalities of the teachers? It is only natural to wish to hear more about them from so capable an historian as the author of this excellent book.

All Edinburgh students, and many others not privileged to use the title, would have enjoyed more intimate stories of Douglas Maclagan and "Dismal Jimmie". When the great "flitting" took place from the old infirmary to the new, a crusty old dame in her really nice, new, bright ward was asked: "Mistress, how do you like your new quarters?" "I dinna like them ava." "How's that?" "Hoo can I like a place that is aw warmed wi drains?" That is how the old woman regarded the hot-water pipes which mitigated the winter cold in the long corridors. Surely a few stories of Joe Bell's ("Sherlock Holmes's") diverting clinics might have been told, or of Tommy Annandale's caustic comment on the loud noise made by Dr. Bell's large following: "Shut that door and keep out the noise of Dr. Bell's rabble." Again, there is a story of Mrs. Janet Porter's attack on Sir Joseph Lister, the son-in-law of her hero, James Syme. Mrs. Porter always put a "gaitherin coal" on her sitting-room fire at night before she went above it to her bedroom, so that it could be broken up in the morning into a cheerful blaze. One winter morning at about 2 a.m. Lister had to come to the hospital to do a primary amputation. He went into Mrs. Porter's room and broke up the coal. Mrs. Porter came out in her mutch, calling out: "Whae the deevil is that breakin ma gaitherin coal?" "It's me", said Lister in a humble tone. "Weel, I dinna care whae ye are, I no hae onny buddy breakin my coal!"

This book is a fine record of the growth of a great hospital and of a great medical school, and even, if, at times, we are left a little unsatisfied in our search for what Cushing would call "the soul of the hospital", yet it is impossible not to regard this work as a most commendable piece of medical history, accurate and full, particularly to all of those who were students or resident medical officers within its loved and respected walls all these long years ago.

[1] "Story of a Great Hospital: The Royal Infirmary of Edinburgh, 1727-1929", by A. L. Turner, M.D., LL.D., Hon. F.R.C.P.; 1937. Edinburgh: Oliver and Boyd. Royal 8vo, pp. 421, with illustrations. Price: 10s. net.

OBSTETRIC MANAGEMENT.

"PRE-NATAL AND POST-NATAL MANAGEMENT", by J. St. George Wilson, is a well-written book of 200 pages, containing such clear advice and teaching that it will be added to the library of many a general practitioner.[1] It is printed on good paper, and the illustrations are mostly reproductions of X ray photographs, which show the place of radiography in this branch of science.

The opening chapters deal comprehensively with history taking and clinical examination of the patient. The author is rather dogmatic when he makes such statements as "menstruation in the presence of a living pregnancy is impossible".

[1] "Pre-Natal and Post-Natal Management", by J. St. George Wilson, M.C., M.B., Ch.M., F.R.C.S., L.R.C.P., F.C.O.G., with a foreword by Sir Comyns Berkeley, M.C., M.A., M.D., F.R.C.P., F.R.C.S., F.C.O.G.; 1937. London: Edward Arnold and Company. Demy 8vo, pp. 214, with illustrations. Price: 10s. 6d. net.

When dealing with the descent of the head of the fœtus, the author stresses the importance of palpating the levels of the occiput and sinciput. This is difficult to do in most women, and the author might well refer to Professor Windeyer's method of palpating the anterior shoulder. The author does not believe that posterior positions of the fœtus can be rectified by the application of pads and binder after Buist's method.

He stresses the fact that aperients are necessary throughout a pregnancy, but does not mention the useful class of lubricants.

There is an excellent chapter on hæmorrhage in pregnancy, and the treatment is given for all types of bleeding.

It is surprising that the author does not advocate the induction of premature labour for a contracted pelvis or an oversized infant. He gives four most unconvincing reasons for this view and advocates Cæsarean section if natural delivery fails. He is opposed to rupture of the membranes as a method of inducing labour, though this method is used with much success at the Rotunda Hospital. He uses quinine and castor oil for induction of labour if the infant is post-mature, and if this fails he tells the patient to wait, as she must be mistaken in her dates.

The difficulties of cardiac complications are well set out, and the new method of strapping varicose veins in the thighs is illustrated; it is considered safe to inject varicosities of legs or vulva to within a few weeks of delivery.

A detailed résumé of easy biochemical and microscopic tests in the examination of the urine is given; this will be a boon to those who grow rusty in rural practices. An interesting point in the chapter on albuminuria is the treatment according to the theory of water intoxication, and if water balance cannot be effected in ten days, termination of the pregnancy is recommended.

The chapter on the reasons for procuring abortion or inducing premature labour are clear and interesting; but few will agree that it is easy to remove uterine contents digitally at any time up to fourteen weeks of gestation. Œstrin is mentioned as being an efficient abortifacient when the fœtus has died. The author also mentions such modern treatment as the use of progestin and wheat germ capsules for the prevention of habitual abortion.

The portion of the book describing post-natal care is much shorter, and does not deal with the lying-in period. Some unusual advice is given, in that every cervix should be cauterized eight weeks after parturition. There is a good list of remedial exercises with illustrations.

Although we may differ from the author in some minor matters, the fact that the work is most complete, well written and methodically arranged will make it popular with all practitioners who are interested in the welfare of the mothers of the nation.

THE EDUCATION OF THE EMOTIONS.

IN "The Education of the Emotions" Margaret Phillips, M.A., has completed a research on a very vital subject.[1] The author points out that modern authorities on education stress the need for emotional training, but that there is little known as to the methods for encompassing the ideal sentiments.

> The aim of the present inquiry is then in some degree to remedy this discrepancy. Assuming the education of the emotions to be as urgent and important as has been suggested, we shall attempt some sort of answer to the question: How is it to be carried out? And we shall hope to reach our answer by investigating a further question: Where educated emotions do in fact exist, how has this result been brought about?

The method adopted is described thus:

> I asked 275 collaborators to give me, in writing, a life history of any developed "sentiment, passion or interest" of their own, showing the stages of its development, the sources from which it derived, and the nature of the satisfaction obtained from it. In cases where fuller guidance was asked for the following catechism was offered:
>
> Try to trace the earliest beginnings of the interest or sentiment in childhood.
>
> Give the main stages of the development of the interest or sentiment up to the present, considering such matters as the influence of:
>
> The environment in which you grew up,
>
> Parents, brothers and sisters,
>
> Other relatives,
>
> Playmates and friends,
>
> Other adults, including teachers,
>
> The various schools you attended, taken separately,
>
> College education, if any,
>
> Any other social bodies, e.g. church, clubs, etc.,
>
> Other factors, e.g. reading, travel.
>
> What emotions and activities have been aroused in connexion with the interest?
>
> What further interests have grown out of it?
>
> What other interests have contributed to its development?
>
> Please give your age as nearly as possible at each point.

The book consists of extracts from the original protocols connected by a running commentary on the significance of the material. The collaborators are obviously highly intelligent people, who have given extremely interesting "confessions". They are in fact far more readable than the average case history.

The material is too great to condense into a brief summary. The author's summary is as follows:

> As regards the general course of sentiment-development, we have suggested that emotions and attitudes naturally develop first in relation to those persons and things in the immediate environment which have most significance for early needs, and that, as needs and powers expand, purposive striving is directed to goals which are less urgent and more disinterested. Where any attempt is made to reverse this line of development, to force interest and attention prematurely afield, the result is the formation of what we have called "false" sentiments, involving either the attachment of relatively immature emotions to objects which should be reached at a more advanced stage of development, or the organization of emotions around something other than the professed object of the sentiment.

The protocols deal with a diversity of sentiments, self and others, from persons to things, family and social groups, larger societies, intellectual interests, sports crafts and skills, natural beauty, music, painting, poetry, drama, prose, abstract ideals, religion.

The reader is struck by the constant repetition of several major factors in the development of sentiments. The importance of an early success in childhood on lines converging on the subsequent sentiments, the influence of the parents and friends, the use of the growing sentiment as an escape from the dreary monotony of circumstance, and the individual nature of the sentiment material.

Whilst the author does not point an unerring finger at the way to cultivate the right emotion, she is to be congratulated on correlating a mass of autobiographical knowledge. If psychology is to attain maturity, psychologists must use such methods in order to be able to strike a correct balance between intellect and emotion. This is a vast problem which has repercussions in every branch of sociology. We trust that the "Education of the Emotions" will have the wide audience which it deserves.

[1] "The Education of the Emotions through Sentiment Development", by M. Phillips, M.A.; 1937. London: George Allen and Unwin Limited. Large crown 8vo, pp. 318. Price: 8s. 6d. net.

The Medical Journal of Australia

SATURDAY, MARCH 26, 1938.

All articles submitted for publication in this journal should be typed with double or treble spacing. Carbon copies should not be sent. Authors are requested to avoid the use of abbreviations and not to underline either words or phrases.

References to articles and books should be carefully checked. In a reference the following information should be given without abbreviation: Initials of author, surname of author, full title of article, name of journal, volume, full date (month, day and year), number of the first page of the article. If a reference is made to an abstract of a paper, the name of the original journal, together with that of the journal in which the abstract has appeared, should be given with full date in each instance.

Authors who are not accustomed to preparing drawings or photographic prints for reproduction, are invited to seek the advice of the Editor.

RHEUMATISM IN AUSTRALIA.

THE article by Dr. F. John Poynton, of London, on rheumatism, or as he would prefer, the rheumatisms, published in this week's issue, is most opportune. Dr. Poynton has been known for many years as an authority on pædiatrics, and anything which he has to say on such a subject as rheumatism must be listened to with respect. It should not be necessary to draw attention to the great mortality and the crippling sequelæ of acute rheumatism on the one hand nor to the enormous amount of suffering and disability occasioned by that group of conditions known as the chronic rheumatic diseases on the other. It would be well, of course, if both pathologists and clinicians tried to distinguish between acute rheumatism and the chronic rheumatic diseases by choosing a name that could be applied to the chronic diseases. We are apt to forget that the word rheumatism is really little more than a cloak for ignorance. Obviously the chronic rheumatic diseases are not understood as they should be or we should not have such a variety of classifications for them. At the same time we are apt to forget that even acute rheumatism, commonly known as rheumatic fever, though recognized as associated generally with the *Streptococcus hæmolyticus*, has not been proved to be due to that organism only. There are thoughtful and earnest investigators who believe that a virus may have something to do with its causation (see THE MEDICAL JOURNAL OF AUSTRALIA, November 13, 1937, page 885).

The work that has been done on acute rheumatic infection is enormous and, as far as chronic rheumatic diseases are concerned, readers will at once call to mind the several reports that have been issued by the British Committee on Chronic Rheumatic Diseases appointed by the Royal College of Physicians of London and that have been discussed from time to time in this journal. At the Hobart Congress in January, 1934, a special resolution was passed asking the Federal Council to take some steps to secure the investigation of rheumatism in Australia. Nothing was done, chiefly because the Federal Council had no machinery that it could set in motion for the purpose. The fact remains, however, that one of the councillors airily dismissed the subject by remarking that rheumatism in Australia was no different from rheumatism anywhere else. This idea is all too prevalent, and Dr. Poynton, in the present issue, gives good reasons for regarding it as false. There have been in the Commonwealth several workers who have treated this subject seriously and who have done their best by their investigations and writings to keep it in the eye of the medical public. We have in this connexion previously mentioned Dr. J. Kempson Maddox, of Sydney, and Dr. H. Boyd Graham, of Melbourne. Dr. Poynton makes mention of their efforts in his article. From the Adelaide congress of last August a recommendation was sent to the Federal Council that rheumatism should be the subject for the plenary session of the Perth congress in 1940. The Federal Council decided to send the resolution to the executive committee of the congress.

In asking the prospective executive committee in Perth to give to this request the most careful consideration we would direct their attention to what Dr. Poynton, a world authority on the subject, has written. If rheumatism is to be the chosen subject, it must be discussed in the light not of preconceived

ideas, but of work carried out for the purpose of the congress. A little more than two years remains in which organized investigation into rheumatism in Australia can be carried out. The Adelaide congress bids fair to achieve something in the field of tuberculosis. Perth should not be slow to follow so successful a lead—the subject is one likely to yield fruitful results, and the time for the making of the necessary investigations is all too short.

Current Comment.

THE EFFECT OF MERCURIAL DIURESIS ON CONGESTIVE HEART FAILURE.

An important communication has been published by L. E. Hines concerning the effects of mercurial diuresis upon the clinical course of congestive heart failure.[1] Hines comments on the great variability of the course of congestive heart failure. Dyspnœa may be present years before other manifestations. On the other hand, there may be rapidly increasing dyspnœa, orthopnœa and visceral stasis with death in a few weeks or months. Statistics can offer little aid in estimating the life span of patients with congestive failure. Accordingly it is extremely difficult to estimate the efficacy of a therapeutic agent in this condition. The œdema of congestive heart failure is extensively treated by mercurial diuretics, although the removal of œdematous fluid does not generally alter the progressive course of the underlying disorder—it may symptomatically relieve the patient, but it has no curative effect on the primary disease. It is a matter of common knowledge that rest in bed, digitalis and xanthine diuretics sometimes fail to induce diuresis. There is no question that mercurial diuretics may be efficacious in patients who do not respond to simpler measures. Further, mercurial preparations may generally be continued over long periods without producing harmful effects. Untoward effects, however, have been noted in some instances after "Merbaphen", and there have been fatalities after the administration of "Salyrgan". Undesirable cumulation is not generally to be apprehended, as the mercury is completely eliminated within twenty-four hours of administration. Chill, rash and fever have been described and D. Poll and J. E. Stern have mentioned a syndrome following mercurial diuresis and characterized by weakness, restlessness, psychosis, and mental confusion sometimes progressing to coma and death. On account of poor turgor of the tissues, dry tongue and excessive thirst, with recovery when salt and fluid were administered, Poll and Stern attributed the condition to depletion of water and of sodium chloride.

Hines states that he had the impression that life expectancy was not prolonged in many patients, although œdema was controlled. He further observed that patients who had uræmic manifestations died shortly after the œdema had been relieved by mercurial diuresis. He selected a group of patients suffering from hypertensive and arteriosclerotic heart disease. The duration of life after the onset of congestive failure of the group treated by the intravenous administration of mercurial diuretics was compared with a group of patients from the same hospital, studied and reported by N. Flaxman. Nothing was seen indicating that mercurial diuretics increased the life span. Hines found no encouragement in the fact that only twelve of sixty patients treated in 1935 are still living. The tables showed that the incidence of uræmia was more than doubled in the group receiving mercurial diuretics. Flaxman, however, did not state the criteria for his diagnosis of uræmia. Hines states that the basis of diagnosis in his own series was a syndrome of mental and gastro-intestinal symptoms associated with retrogenous retention and impaired renal function. Hines admits that his series is too small to conclude that mercurial diuretics have the capacity *per se* to cause uræmia, but he insists on the necessity for a critical study of an arteriosclerotic patient who is suffering from congestive failure before powerfully active diuretics are used. He states that examination of the reports on the effects produced by mercurial diuretics reveals metabolic changes resembling those of uræmia. For instance, increased excretion of water and chloride and decreased chloride content of the blood plasma are consistent features of mercurial diuresis and are also associated with the uræmic state. The production of acidosis which is necessary for efficient mercurial diuresis may also be conspicuous in uræmia. Increase in the concentration of blood urea, which is a uræmic manifestation, has been noted in the diuresis following "Salyrgan" administration. H. L. Blumgart has demonstrated an increased excretion of sodium, potassium and calcium after mercurial diuresis, this constituting another possible factor in causing a metabolic disorder.

In view of possible harm resulting from "Salyrgan" administration, Hines uses this preparation only when rest, digitalis and xanthine diuretics do not evoke the required diuretic response. A preliminary examination of the patient includes estimation of the plasma chloride content, the urea nitrogen content, the carbon dioxide combining capacity, and the blood phenol content. "Salyrgan" is not administered if these values are very abnormal. During the period of diuresis, determinations are made, and more often if uræmia seems to threaten. Considerable lowering of the plasma chloride content, when associated with mental symptoms, indicates a need for intravenous administration of saline solution. Lowering of the carbon dioxide combining capacity, with symptoms of acidosis, requires a restriction of ammonium chloride with exhibition of glucose and sodium

[1] *The Journal of the American Medical Association*, January 15, 1938.

bicarbonate. The initial dose of "Salyrgan" should be given intramuscularly to exclude the possibility of the rare hypersensitive reaction. Secretion of large amounts (from 5 to 10 litres daily) is more dangerous than secretion of lesser quantities. Blood examinations have shown no consistent picture before or after mercurial diuresis. Hines asserts that marked diuresis may institute a metabolic upset detrimental to the patient, and harmful effects probably are due to the rapid removal of large quantities of œdematous fluid rather than to renal damage. He holds that mercurial diuretics should be used conservatively. In a discussion which followed Hines's' communication, A. C. De Graff stated that although the lives of some patients might be shortened by mercurial diuretics, he did not think that they should be withheld. However, he admitted that necessary precautions should be taken. He further considered the possibility that certain mercurial diuretics allowed storage of mercury at the site of injection and that mercury remained there for some time.

ANXIETY STATES AND CERTAIN RELATED PHYSICAL PHENOMENA.

It is doubtful whether sufficient is known yet concerning the actual mechanism by which certain symptoms are produced in the anxiety states. Even the most docile and cooperative patient wishes to have not only an explanation of his condition, but relief from his symptoms, and experience teaches us that a simple talk with explanation and advice is not necessarily enough to bring about a cure. Although all patients do not wish to be cured, we hope all doctors wish to see them cured. The "functional" types of patients "haunt the offices of physicians and specialists in every field of medical practice", as is truly remarked by W. J. Kerr, J. W. Dalton and P. A. Gliebe in writing on this subject, and we must sorrowfully agree with them also when they admit that "the sins of commission inflicted upon them fill many black pages in our book of achievement".[1]

In particular these authors have interested themselves in patients who suffered from so-called convulsive seizures in addition to their tensional anxiety state. They observed that these patients presented signs and symptoms of tetany associated with hyperventilation, and they believe that this syndrome is commoner than might be generally believed. They emphasize that the symptoms may be referable to many different bodily structures, that they may be so extremely localized as to lead to a suspicion of focal disease, and that the hyperventilation in such persons will precipitate and maintain a state of hyperirritability approaching clinical tetany. As is well known, tetany depends for its production upon the degree of mobilization of the calcium ions (probably the diffusible fraction thereof), the presence of alkalosis or a state of tissue anoxæmia. Hyperventilation exemplifies one of the mechanisms which may cause it, and the authors quote from writers of a much earlier date, who recognized the psychological, which perhaps also connotes the physiological, background of this state. There is, for instance, the celebrated reference of Shakespeare to the lover "sighing like a furnace". Kerr, Dalton and Gliebe go on to point out that it is wrong to assume that the symptoms described by an anxious patient are of necessity due to imagination or to a desire to occupy the centre of the domestic stage. They presume that a chronic anxiety state induced by conflict may even predispose to structural disease. In their present investigation they have included a hyperventilation test in their examination of the patient. After routine history-taking and examination they instructed the patient so as to induce him to breathe eighteen to twenty times a minute for a considerable period, lasting up to thirty minutes. If such a condition as carpo-pedal spasm was produced during the test, the time elapsing before its appearance was noted and the patient was then allowed to breathe oxygen containing 30% carbon dioxide, or else he was instructed to hold his breath or to rebreathe in and out of a paper bag. Either of these manœuvres was frequently successful in terminating an attack, and a simple explanation of the mechanism involved was made to the patient to convince him that apparently alarming symptoms might arise from quite simple causes. A considerable number of case histories is appended to the article, illustrating the production of tetany, general muscular irritability, a convulsive state simulating *grand mal*, local spasms of muscles, vascular disturbances, and other disturbances simulating respiratory disease, such as asthma and gastro-intestinal disease. A complete cooperation of the patient is naturally a *sine qua non* for the success of the experiment. A complex chart is appended to the article, tracing the course and result of the original stimuli usually arising from romance or finance as they affect the autonomic nervous system and all its complex ramifications. Many of the physiological effects of hyperventilation are discussed, but the article is chiefly of interest as describing a mechanism of phenomena which might easily be labelled as simply "functional" without any attempt to understand how they arise.

In treatment the authors used the customary measures employed alike by the psychiatric specialist and the sympathetic general practitioner; these they optimistically term curative, but they do so only to throw up into sharp distinction the purely palliative measures, which are those of medication.

As a reminder of the physiological background to the anxiety states this work is of interest. Perhaps enthusiasm has attributed rather too wide a group of symptoms to hyperventilation, and perhaps suggestion plays a part in diagnosis as well as treatment, but if such enthusiasm has reduced the number of the unhappy, anxious patients it has played its part.

[1] *Annals of Internal Medicine*, December, 1937.

Abstracts from Current Medical Literature.

BACTERIOLOGY AND IMMUNOLOGY.

Intracutaneous "T.A.B." Vaccination.

R. M. PERRY (*African Journal of Hygiene*, September, 1937) has made a comparison of typhoid *O* and *H* agglutinin responses following intracutaneous and subcutaneous inoculation of typhoid-paratyphoid *A* and *B* vaccine. The agglutination titres and the local and systemic reactions were followed in two groups of medical students, of which one comprised students who had never been vaccinated, and the other comprised students who had had one or more immunizing injections. Lederle's "T.A.B.", containing 1,000 million killed typhoid bacilli, 500 million paratyphosus *A* bacilli and 500 million paratyphosus *B* bacilli, was used for all injections. The doses for Group 1 were 0·05, 0·1 and 0·1 cubic centimetre given intracutaneously, and 0·5, 0·8 and 1·0 cubic centimetre given subcutaneously at intervals of a week. Group II received a single injection of 0·1 and 1·0 cubic centimetre intracutaneously and subcutaneously respectively. Blood was taken five weeks and one year later, and tested for *O* and *H* agglutinins. The *H* antigen consisted of ordinary formalinized broth cultures; the *O* antigen used was alcoholized antigen prepared according to Gardner's method. The results of testing serum collected five weeks after inoculation showed that intracutaneous injection had produced titres of each antibody as high as those elicited by subcutaneous injection. The tests performed after an interval of one year showed a loss of *O* agglutinins in 25% of cases, while the general titres were much lower, but at about the same level in each group. The local reactions were much smaller in the subjects vaccinated intracutaneously, and were mild. The reactions after subcutaneous injection were larger and more frequent, but not severe. There was no relation between local reaction and the agglutinin content of the serum.

Intrathoracic Calcification in Tuberculin-Positive Infants.

MIRIAM BRAILEY (*Bulletin of the Johns Hopkins Hospital*, October, 1937) has made observations on the development of intrathoracic calcification in infants who react to tuberculin. The material for study consisted of children who were under the age of two years at the time of the first positive reaction, who showed no X ray evidence of intrathoracic calcification, and who were followed by serial X ray examinations for periods up to five years, at least one photograph being taken each year. Of the 158 children studied, 24 died without evidence of calcification, and of the remainder, 17% showed calcification at the end of one year, 47% after two years, and 66% after four years. Differences in the rate of appearance of calcification in white and coloured children were sought, but it was found that the two groups were roughly similar. It was noted that during the whole period of attendance the children were treated with cod liver oil, and further, that a significantly larger proportion of coloured children showed evidence of unhealed lesions in the lung parenchyma. About one-fifth of the children who reacted to tuberculin showed no X ray evidence of infection at the first examination, and developed calcification during the period of observation. In a few patients a gradual disappearance of the lesions was noted, deposits of calcium being completely absorbed. Testing of the patients at a later date did not reveal any appreciable loss of the allergic reaction, although in one case, not included in the series, diminution in the size of the reaction was noticeable.

Bacillus Paratyphosus B in Fæces.

V. GLASS AND H. D. WRIGHT (*Journal of Pathology and Bacteriology*, September, 1937) have followed the isolation of *Bacillus paratyphosus B* from the excreta of patients suffering from paratyphoid fever. An outbreak of paratyphoid fever in Liverpool provided an opportunity for testing fæces and urine in cases in which no other method of examination was made. The method used was emulsification of 0·5 gramme of fæces in five cubic centimetres of tetrathionate broth. A loopful was plated on to brilliant green eosin agar immediately. The emulsion was incubated overnight, and if the plates were not positive they were subcultured after this period of enrichment. Urine was inoculated in one cubic centimetre amounts into tetrathionate broth and then plated. Characteristic colonies were picked off, emulsified in agglutinating serum and examined under a low power lens. In the majority of cases an immediate diagnosis was possible. This was confirmed later by fermentation tests and macroscopic agglutination. In 91·4% of cases the causal organism was isolated from the first specimen of fæces tested, and from the urine at some time during the illness in 35·7% of cases. In five cases the causal organism was not found; in three of these positive results were obtained by the Widal test; in the other two the diagnosis was not established bacteriologically. The preliminary enrichment in tetrathionate broth was thought by the authors to have produced the high percentage of positive cultures, while culture made directly from the fæces had the advantage that, if positive, it enabled a diagnosis by slide agglutination to be made within eighteen hours. The disappearance of bacilli from the fæces was observed at irregular intervals up to fifteen weeks from the onset, and it was found that in 50% of cases cultures remained positive for six weeks. After the sixth week the percentage of cases in which bacilli were cultured from the fæces remained high, owing to the natural selection of the carrier group for further cultures. The urine cultures were much less significant, as no positive cultures were obtained from urine in cases in which the fæces had not already yielded a growth of the organism, while in as many as sixty cases in which culture from the fæces was positive, the corresponding specimen of urine was "negative". The authors point out that this method is applicable to the cultivation of *Bacillus typhosus* and *Bacillus paratyphosus A*, but that *Bacillus paratyphosus B* is a hardier bacillus and would probably be more readily cultivated, yielding a higher percentage of positive results.

McLeod's Medium for the Gonococcus.

LUTHER THOMPSON (*Journal of Infectious Diseases*, September-October, 1937) has made observations on McLeod's method for culturing the gonococcus in an atmosphere of 8% to 10% carbon dioxide, dimethyl paraphenylene diamine hydrochloride on the surface of the medium being used, so that the colonies of the gonococcus developed a purple colour. The author points out that there are two organisms which produce the colour reactions; he has found these in from 1% to 2% of 4,600 cultures made by this method. One is a small Gram-negative bacillus, which grows readily on nutrient agar, and the morphology of which is distinct. The other is a Gram-negative bacillus which grows in pairs, but possesses tiny central achromatic spots which may cause difficulty. It also grows on nutrient agar. The characteristic pleomorphism of the gonococcus and its tendency to autolyse in culture aid in its differentiation. The author emphasizes the advisability of making stained smears from all colonies and of isolation and testing for ability to grow on nutrient agar.

HYGIENE.

The Risk of Mortality among Offspring of Tuberculous Parents.

JEAN DOWNES (*American Journal of Hygiene*, November, 1937) writes on the risk of mortality among offspring of tuberculous parents in a rural area in the nineteenth century. Her figures are based on the study of 1,400 family histories in Cattaraugus County, New York, and deal

mainly with children born during the latter half of the nineteenth century (1,062 families); parents are excluded as well as babies dying before the first birthday. The life table method of analysis is employed. Only families with a present-day survivor were tested. The informant in each family is therefore omitted to balance up for families who have died out. The general age-sex curve for mortality was closely similar to that of the population in general. Of the 1,062 families, 42 recorded that one or both parents died of tuberculosis before the age of sixty. The average mortality for all causes (adjusted for age and sex) was 7·9‰ for all families and 11·9‰ for the tuberculous group, a statistically significant effect. The excess in this rural area was between the ages ten and thirty. From forty to forty-nine the mortality is similar, while over fifty the tuberculous families show better figures, curiously suggesting the survival of the fittest. The tuberculous death rates per year were 0·8 and 7·2 (special group), a striking difference—approximately a nine times greater risk than in the general population. A further comparison was made with 83 tuberculous families of today, 48 of whom showed pulmonary infections. Up to the age of thirty the death rate is lower, 8·9 as against 11·9, but is still much greater than the general death rate. Similarly, the tuberculosis death rate is 6·5, as against 6·0 when adjusted for age and sex, practically identical with the old figure. Apparently no marked change in hazard to the offspring of a pulmonary tuberculous parent has occurred. The present-day comparison of tuberculous families with the general community, which has an improved figure, shows a fifteen times greater risk. The risk of death from tuberculosis among children in close familial contact with infection is therefore considerably greater than that of the ordinary child in the population.

Observations on the Transmission of Hookworm Infection.

J. ALLEN SCOTT (*The American Journal of Hygiene*, November, 1937) has made observations in Egypt on the transmission of hookworm infection. Cort's procedure of egg counts, soil surveys and isolation of larvæ from soil samples was carried out. Two types of irrigation exist: perennial irrigation in the delta and upper Egypt, and the basin of annual flooding south of Assiut. In the former the villages are only a few feet and in the latter high above the fields. The villages, with their labyrinth of lanes and occasional courtyards, are built of mud brick. The soil, with its high clay content, is packed hard by human feet and remains dry from the relative absence of shade from the sun. The average peasant defecates twice a day, as a rule soon after dawn or after unset, and about one-third of the stools are deposited by males in the streets or adjacent to the village. Men customarily defæcate in the fields when at work, especially favouring the bank of a nearby canal for subsequent ablution. Women and children use the stable or roof or the few pit latrines, or after nightfall go outside the village limits. The characteristic feature is the absence of shelters for repeated use and the entirely promiscuous distribution, due to density of population and intensive cultivation. In this the peasant in Egypt differs completely from the Arab in Palestine, where defæcation tends to be concentrated in certain sheltered spots. Dryness of the hard packed soil, exposure to the sun, and lack of loose dirt, and, in the stables, the urine, do not favour larval development. Even in cultures of village soils larvæ do not grow, possibly because of excess chlorides or an associated factor. Out of hundreds of specimens no hookworm larvæ were isolated from village soils, and few from fine clayey field soils. The author does not support Khalil's suggestion of association with the height of ground water. The scattered defæcation reduces the chances of contact. Concentration occasionally occurs in the moist zone just above the water line of canals, ponds or river, where many larvæ were isolated. The infection is, however, widespread rather than intense. This agrees with the widespread low-grade human infection, a contrast to the heavy hookworm burdens amongst people where concentrated soil pollution and intense soil infestation are found.

Zinc Sulphate Nasal Spray in the Prophylaxis of Poliomyelitis.

F. F. TISDALL *et alii* (*Canadian Public Health Journal*, November, 1937) write on the zinc sulphate nasal spray in the prophylaxis of poliomyelitis. Ontario, in August-October, 1937, experienced an epidemic of poliomyelitis affecting 2,436 persons in a population of 3,600,000. In Greater Toronto 958 cases occurred in a population of 808,000, or about 1·2‰. The death rate was low; 43 died, or 4·5%. Of the 739 in the city of Toronto, 3·8% died, the mortality rate being highest from eleven to nineteen years of age. The majority of cases (60%) occurred at the ages three to ten; 23% occurred at eleven to nineteen, while 45% of patients had no paralysis. Trial was given to the nasal spray of zinc sulphate. Over 5,000 children three to ten years of age received an intranasal spray of 0·5 to 1·0 cubic centimetre of a 10% solution of zinc sulphate. The spraying was carried out by specialists at a special clinic. At the second spraying ten days later about 90% (4,585 children) were efficiently dealt with. An additional 749 were sprayed by private practitioners. In less than 1% discomfort required medical attention and was quite temporary. Of some hundreds tested, 13% to 24% lost the sense of smell for a time. In a control group of over 6,000 in the same age group, 19 cases (11 paralytic) occurred six days or more after the date of the first spray. In the sprayed group of 4,700, 11 children were affected, four becoming paralysed. The spraying must be carried out by specialists who can, with skilled assistance, deal with 50 children in an hour and a half. A second spray was given in 10 days' time; more frequent spraying seemed impracticable on a large scale. In not more than 24% was the olfactory area covered as tested by loss of sense of smell. Pentecost advocates an improved technique, with preliminary treatment with "Pontocaine" and ephedrine, and the placing of the patient with head back and dependent. Analysis of the sprayed and of the controls shows that the attack rate was not statistically significant—no evidence is furnished of any protective value of the method employed. As a measure to deal with an emergency the authors do not consider nasal spraying a practical public health procedure.

Venereal Diseases in Toronto in 1937.

GORDON BATES (*Canadian Public Health Journal*, December, 1937) writes on the incidence of venereal disease in Toronto in 1937. A survey based on a *questionnaire* sent to doctors and hospitals dealt with early (under one year) and late syphilitic infections in persons under and over fourteen years of age of either sex, and similarly with gonorrhœa early (under two months) and late. Of the 97% or 893 medical practitioners who replied, 46% had patients under treatment, chiefly early cases (about two-thirds) rather than late. Of syphilis 3,639 cases and of gonorrhœa 2,549 cases were recorded. Clinics dealt with 73% of the former and 52% of the latter. In syphilis (thought to be congenital) nearly 5% of cases occur in persons under fourteen years of age, the sex ratio being equal. In gonorrhœa under fourteen years of age 1·8% of cases occurred, females preponderating, 13 to 1. Of the syphilitics, 57% were males, 43% females. More than twice as many patients with early infections were under treatment by physicians than in the clinics, the reverse applying to later cases. Of all cases of syphilis, 90% were late cases. The rate per population has risen from 4·0‰ in 1929 for syphilis to 5·64‰, and from 3·5‰ for gonorrhœa to 3·95‰. Total venereal infections in the six weeks under review were 9·59‰ ('929, 8·4‰). Under fourteen years of age the proportion has, however, fallen by about 14% in syphilis and 45% in gonorrhœa. Hospital experience reveals a rapid reduction of cases in hospital wards as found by the routine use of the Wassermann test. A decrease in early syphilis and a better diagnosis of late syphilis is suggested by these figures.

British Medical Association News.

SCIENTIFIC.

A meeting of the New South Wales Branch of the British Medical Association was held at the Royal Hospital for Women, Paddington, on July 22, 1937. The meeting took the form of a number of clinical demonstrations by members of the honorary staff of the hospital.

Puerperal and Post-Abortal Septicæmia.

Dr. Bruce Hittmann showed some patients with puerperal and post-abortal septicæmia due to *Streptococcus hæmolyticus* who had been treated with "Prontosil" and allied compounds. He said that "Prontosil" and "Prontosil Soluble" were two different drugs. It had been shown that the sulphonamide group was the active part of "Prontosil" and that the "azo" group could be eliminated without its bactericidal power being impaired. The parent of "Prontosil", para-amino-benzene-sulphonamide, was considered less toxic than "Prontosil", and was shown to be more bactericidal *in vitro* to *Streptococcus hæmolyticus*. Most of the drugs in tablet form allied to "Prontosil", and issued by drug firms under various names, were para-amino-benzene-sulphonamide.

Dr. Hittmann's first patient was a woman, thirty-seven years of age, who was curetted at sea after a miscarriage when two months pregnant. Her temperature had been between 38·9° and 39·5° C. (102° F. and 103° F.) for six days prior to her admission to hospital, and she had had rigors. She was admitted to hospital on June 16, 1937; no distension or rigidity of the abdomen was present, but hypogastric tenderness was found on palpation. There was some slightly offensive, blood-stained discharge *per vaginam*. The uterus was enlarged to the size of a two months' pregnancy, and tender. There was some tenderness of the left appendages; no parametritis was present. The temperature was 40° C. (104° F.) and the pulse rate 120. *Streptococcus hæmolyticus* was cultured from the blood. On June 17, 1937, the patient was given "Streptocide", two tablets three times a day for four days; then she received sulphonamide tablets, two three times a day for five days, the supply of "Streptocide" tablets having been exhausted. On July 19, 1937, her temperature was normal, and it remained so till she was discharged. Her blood was sterile on July 23, 1937, that is, seven days after her admission to hospital. She was discharged, cured, on July 6, 1937.

Dr. Hittmann's next patient was a woman, aged thirty-six years, who was admitted to hospital on April 4, 1937, with a history of having been curetted fourteen days previously after a miscarriage. On her admission to hospital the right femoral vein was thrombosed, the right thigh was swollen with increased venous markings, and there was limitation of movement of the right hip joint. The uterus was soft, flabby and retroverted. The cervix was lacerated and the external os admitted the finger tip. No "masses" were present in the fornices. The temperature was 40·77° C. (105° F.). The pulse rate was 140. On April 8, 1937, her blood was sterile. On April 9, 1937, she had symptoms and signs of a small pulmonary embolism, her temperature being 40° C. (104° F.). On April 16, 1937, there was a large, bluish purple patch on the buttock, due to an embolism in the skin which later broke down to form an ulcer. Her temperature was 40·33° C. (104·6° F.). On April 17, 1937, *Streptococcus hæmolyticus* was grown in culture from the blood and the patient complained of pain in the left shoulder, and had a friction rub over the anterior part of the lower left side of the chest, the temperature being 39·67° C. (103·4° F.). Five cubic centimetres of "Prontosil Soluble" were injected intramuscularly three times a day for three days, then "Prontosil" tablets were given three times a day for thirteen days. On April 27, 1937, the patient's blood was sterile on culture, her temperature being 38·57° C. (101·4° F.). During the administration of "Prontosil" it varied from 39·67° C. (103·4° F.) to 37·91° C. (100·2° F.). The administration of "Prontosil" was discontinued on May 3, 1937; when the evening temperature had not exceeded 37·91° C. (100·2° F.) for five days and the general condition of the patient had vastly improved. On May 10, 1937, her blood was sterile on culture: the lung condition had cleared up, but the right leg was still swollen and the ulcer on the buttock had not healed. She was discharged, cured, on July 6, 1937, eighty-eight days after admission. During the last thirty days her evening temperature was only once above normal, but she was kept in hospital on account of the right femoral thrombo-phlebitis and the slowly healing ulcer.

Dr. Hittmann next showed a patient, aged eighteen years, who was admitted to hospital three days after a breech delivery on March 5, 1937. She appeared very ill, having a mass of vulval and perineal warts and a sloughing second degree tear of the perineum; her temperature was 40·55° C. (105° F.) and her pulse rate 128. *Streptococcus hæmolyticus* was cultured from her blood. No "Prontosil" was available until six days after her admission to hospital; then on March 11, 1937, "Prontosil" was administered for twelve days in doses of two tablets three times a day, her evening temperature at the commencement of the administration being 40° C. (104° F.) and her pulse rate 122. On March 13, 1937, her temperature was 36·59° C. (97·8° F.) in the morning and 37·9° C. (100·2° F.) in the evening. On March 15, 1937, her blood was proved sterile, the temperature being 38·68° C. (101·6° F.) and the pulse rate 124. On March 22, 1937, when her morning temperature was 36·7° C. (98° F.) with an evening rise to 39·01° C. (102·2° F.), no more "Prontosil" was available.

On March 23, 1937, the patient's blood was again found to be sterile. Vaginal examination revealed a parametritis involving the anterior and lateral parametria and extending out to both lateral pelvic walls. The perineum had not yet healed. On March 30, 1937, her blood was still sterile. The evening temperature was 38·35° C. (101° F.) and the pulse rate 104. Her general condition was much improved. On April 10, 1937 (thirty-five days after her admission to hospital), the uterus was anteverted, mobile and well involuted, and the parametritis was less extensive, but the perineum was still unhealed. The evening temperature was 37·25° C. (99° F.) and the pulse rate was 92. The general condition was much improved. On April 26, 1937, the uterus was small and firm; a small, tender mass was present in the right postero-lateral fornix. On June 16, 1937, the patient was discharged, cured.

The case history of a fourth patient was presented by Dr. Hittmann, because she died with *Streptococcus hæmolyticus* in her blood stream, although death was no doubt due to shock. She was exsanguinated when admitted to hospital on July 15, 1937, and she was operated upon immediately. Blood and free fluid were removed from her abdominal cavity. A large tear in the broad ligament was sutured over. A fœtal head was recovered through a hysterotomy incision, and the intrauterine toilet was attended to. She was given a blood transfusion on the operating table. On July 16, 1937, blood culture revealed *Streptococcus hæmolyticus*, and she was given five cubic centimetres of "Solusepticine" intramuscularly every four hours for six doses, in addition to other treatment. The patient died from shock on July 17, 1937, forty-four hours after her admission to hospital.

Dr. Hittmann said that prior to the introduction of "Prontosil" and allied drugs, recovery of a patient suffering from streptococcal septicæmia was a rare event at the Royal Hospital for Women. The last three patients (the fourth patient being omitted) had been treated with "Prontosil" or one of its substitutes, and they had recovered. Whilst three cases were too small a number from which to draw any definite conclusions, yet the results obtained were such that the treatment of any patient suffering from puerperal or post-abortal septicæmia due to the *Streptococcus hæmolyticus* could not be considered complete without the administration of one of these drugs.

Malpresentation and Malposition.

DR. H. A. RIDLER demonstrated cases of malpresentation and malposition showing the accuracy of information obtainable by the method of palpation as taught in the department of obstetrics of the University of Sydney. He showed a patient with a dead fœtus one week over her estimated date of confinement. The fœtus had been dead three weeks. He pointed out that the case illustrated all the signs and symptoms that could be obtained when a dead fœtus was present, except X ray signs. This examination had not been made.

Dr. Ridler next showed a patient with a cyst of the anterior vaginal wall—a cyst of Gärtner's duct. This projected externally and might easily have been mistaken for a cystocele, but the patient was a *primipara*; she was also on term.

The "Antuitrin S" Test for Pregnancy.

DR. G. STENING showed patients illustrating the "Antuitrin S" test for pregnancy. He said it was reliable in some cases, but as it depended on a "negative" reaction for the diagnosis of pregnancy, certain factors in regard to the intradermal test had to be observed, as well as the product for injection. With further control it might develop into a useful adjunct to the diagnosis of pregnancy, but care should be taken not to rely too much on it.

Pathological Exhibits.

Choriocarcinoma.

DR. P. E. WALTON SMITH gave the history of a patient, aged forty-three years, who had had four children and four miscarriages, and who was admitted to hospital on September 23, 1936, with a history of severe hæmorrhage during the past two days. The last period had occurred on June 24, and amenorrhœa had been continued until September 10, when she commenced bleeding *per vaginam*; the fœtal parts were supposed to have come away before she was curetted in her own home on September 14. Examination *per vaginam* was made. The vagina contained dark blood clot, the cervix was soft, the os was dilated, and the uterus was anteverted and enlarged to the size of a two-months pregnancy. The patient was again curetted on the day after her admission to hospital; the scrapings were not examined. She was readmitted to hospital on October 27, 1936, with a history of pain in the left iliac fossa since October 22, frequent vomiting, and bleeding *per vaginam* since October 24. Examination *per vaginam* revealed that the cervix was soft and hypertrophied, and was in the mid-line; the *os externum* admitted one finger easily; the uterus was enlarged to the level of the umbilicus, being tender and cystic and freely movable. Some thickening and tenderness were noticed in the left fornix, and a mass was palpated in the right fornix; it was thought that this might be an ovarian cyst.

On October 30 there was a positive response to the Aschheim-Zondek test with a 1 in 50 dilution; on November 6 there was a positive response with a 1 in 100 dilution. On November 14 the patient had a brisk hæmorrhage and complained of abdominal pain, worse on the left side, and extending as high as the umbilicus. She died the following day.

At the *post mortem* examination the uterus, which was enlarged almost to the level of the umbilicus, was removed entire, and a spongy mass was noticed protruding from the cervix. When the uterus was opened a reddish growth was seen filling the uterine cavity and adherent to the wall, and the uterine muscle was considerably thickened; the uterus was 17·5 centimetres (seven inches) long by 12·5 centimetres (five inches) wide, and the growth was largely infiltrated with blood. Numerous cysts were present in both ovaries. There were secondary deposits in both lungs.

Sections of the growth proved it to be a malignant neoplasm with the structure of choriocarcinoma. No villi were present, but there were a disorderly proliferation of syncytial cells and Langhans's cells, a large amount of blood clot, numerous thin-walled blood sinuses and areas of necrosis. Section of the uterine wall revealed the growth invading the musculature and the presence of malignant cells in the blood sinuses. The specimen exhibited consisted of the uterus with the growth exposed and the two enlarged ovaries, each of which contained numerous thin-walled cysts. Dr. Walton Smith said that these cysts, which were probably of luteal origin, were commonly found associated with the condition.

Endometriosis.

Dr. Walton Smith's next case history was that of a patient, aged twenty-eight years, who complained of a brownish vaginal discharge for some days prior to and after menstruation; this condition had been present for about nine months previous to her admission to hospital. There had been intermittent right-sided pain for some years. At operation Professor Windeyer found a large left ovarian cyst, which contained about thirty ounces of dark chocolate-coloured fluid; the cyst was adherent to the peritoneum and ruptured during the separation of the adhesions. Several hard masses, about 1·25 centimetres (half an inch) in diameter, considered to be of endometrial origin, were felt in the adhesions at the bottom of the pouch of Douglas, and similar masses were present in the utero-vesical pouch. The right ovary, which was also adherent, contained several cysts, in one of which there was about half a teaspoonful of semi-solid chocolate-coloured material. Both tubes and ovaries were removed. The patient was discharged from hospital twenty-four days after operation.

The specimen exhibited consisted of the cystic ovaries with portions of both Fallopian tubes. In the right ovary, besides the chocolate cyst, there were several follicular cysts and one which was microscopically identified as a tar luteal cyst. In the wall of the left tube, in which a considerable amount of inflammatory thickening had occurred, there were several areas which presented microscopically the typical appearances of uterine mucosa—glands and stroma. A section of the wall was demonstrated.

Large Suppurating Ovarian Cyst.

Dr. Walton Smith next showed specimens from a patient, aged twenty-five years, who was admitted to hospital on July 6, 1937, with a history of having been confined one month previously. The presence of a medium-sized cyst had been noted during the early months of pregnancy. The patient was well for eight days after confinement, when she complained of increasing enlargement of the abdomen. She was very ill when admitted to hospital, with a temperature of 40·55° C. (105° F.), a pulse rate of 144 and respirations numbering 48 per minute. On July 9 Dr. Farranridge operated and found a large ovarian cyst extending upwards to the xiphisternum and across to both flanks, almost completely filling the peritoneal cavity. The cyst contained purulent fluid.

Macroscopic examination revealed a fairly thick wall, the interior being covered with adherent purulent material. Microscopic examination of the sections revealed a thick wall of fibrous tissue; in places there was a columnar cell lining, but the epithelial cells had been mostly destroyed by the acute inflammatory process, the formation of granulation tissue and pus.

Rudimentary Right Kidney.

Dr. Walton Smith's next specimen, consisting of kidneys, ureters and bladder, was removed *post mortem* from a patient who died from acute lobar pneumonia. Shortly before death she gave birth to a premature stillborn infant. At the autopsy it was thought at first that the right kidney was missing, but eventually the right suprarenal gland and kidney were located in front of the spinal column; they were about equal in size. The right ureter was found and traced to the bladder; it was patent, but somewhat smaller than the left ureter. The thickness of the small kidney was only about the same as that of the suprarenal gland. When the kidney was opened there was definite evidence of kidney substance, but the dis-

tinction between cortex and medulla was not obvious. The left kidney was somewhat larger than normal.

Torn Vagina.

The next specimens shown by Dr. Walton Smith were from a patient, aged thirty-three years, who was admitted to hospital as an urgent case for removal of an adherent placenta. She had been delivered with instruments of a live male infant weighing seven pounds. The third stage of labour was prolonged and there was a moderate degree of *post partum* hæmorrhage; an attempt at manual removal of the placenta was made, but was not successful. On her arrival at hospital the patient was found to be suffering from profound shock; she was cold and clammy, and the pulse rate was 160 per minute, the pulse being of very poor volume. The placenta was manually removed, but in spite of stimulation with adrenaline and "Coramine" given hypodermically, and saline solution given intravenously, the patient died five hours after the baby had been born. At *post mortem* examination, when the abdomen was opened, about half a pint of fluid blood was found in the peritoneal cavity; the uterus was enlarged and soft, occupying the greater portion of the lower part of the abdomen. When the uterus was lifted up and well forward a ragged tear, about 7·5 centimetres (three inches) in length was seen in the peritoneum on the left posterolateral aspect of the pelvic floor, close to the uterus; this tear communicated with the vagina through the vault, close up against the cervix.

Other Specimens.

Other specimens exhibited were as follow. A uterus the size of a five-months pregnancy, removed by Dame Constance D'Arcy, was shown, in the wall of which was a large myoma undergoing extensive cystic degeneration. A uterus removed by Dr. Hipsley from a patient aged forty-eight years, who had menorrhagia and an offensive yellow discharge for eight months before operation, was also shown. The uterus contained a large polypus attached to the anterior wall; histologically the growth proved to be a fibromyoma, mostly very cellular, with large thin-walled blood spaces, numerous hæmorrhages and inflammatory changes. A complete uterine cast, which was passed *per vaginam* by a patient who had an ectopic gestation, was shown also.

Resuscitation of the New-Born.

Dr. F. Brown Craig demonstrated an apparatus for the resuscitation of the new-born. He said that in the light of new knowledge of the physiology of respiration the vigorous methods of artificial respiration formerly applied to the new-born baby had been considerably modified. It was now established that for the stimulation of adequate respiratory efforts the essentials were the provision of a supply of oxygen, the prevention of a too excessive loss of carbon dioxide, and the prevention of heat loss from the infant's body, together with the provision of a free airway. The adoption of oxygen and carbon dioxide mixtures and the abolition of drastic attempts at artificial respiration had combined to make the resuscitation of the new-born infant a help towards its recovery rather than a hindrance. In the majority of cases the ordinary methods of treating asphyxia by clearing the upper respiratory passages and by providing an atmosphere of oxygen and carbon dioxide through a naso-pharyngeal tube were entirely satisfactory. In a small number of cases, however, a child was lost through failure of this ideal atmosphere to reach the lungs.

Dr. Brown Craig said that J. B. Blaikley and G. F. Gibberd, of Guy's Hospital, London, had designed an apparatus for resuscitation in this latter group of cases, in which the spontaneous efforts of the baby to provide the necessary lung ventilation were absent. He referred to an article in *The Lancet*, March, 1935, at page 736. The success of this apparatus depended upon the fact that to obtain satisfactory expansion of the lung a pressure of gas equivalent to 15 to 20 centimetres of water in the bronchial tree had to be obtained. The apparatus consisted of an intratracheal catheter, connected to a reservoir consisting of a rubber bag, into which the gas was liberated, with a manometer to control the pressure interposed between the two. The catheter was introduced through a pharyngoscope of the Chevalier Jackson type on a small scale. First the air passage was cleared of liquor and mucus by the ordinary suction methods; the child was placed on a table inclined at 15° with horizon, in the hanging head position. With direct exposure of the glottis through the pharyngoscope the catheter was introduced for 2·5 centimetres (one inch) into the trachea. The bag was filled with "Carbogen" mixture from a sparklet cartridge and the necessary pressure was obtained by manual pressure on the elastic reservoir. Intermittent pressure to imitate respiratory efforts was unnecessary, for once the collapsed lung was expanded natural respiration would be established. Once a spontaneous expiratory effort was obtained, like a first cry, against the positive gas pressure, the lung expanded. The mere fact that the bronchial system was distended was a strong stimulus to the expiratory movements. If a continuous flow of oxygen through the bronchial system was provided, the movements of respiration were not necessary for the process of lung ventilation to go on in the complete absence of respiratory movements. This enabled the medullary centre to recover its sensitivity and the flaccid laryngeal muscles to recover their tone.

Obstetric Ether Apparatus.

Dr. T. H. Small demonstrated an obstetric ether apparatus by which ether was inhaled through a filter of gauze moistened with perfume, such as eau-de-Cologne. He said that it could be administered intermittently at the onset of each pain, and it had the effect of giving considerable relief from pain and total relief in a certain number of cases—about 7%. It did not cause any ill-effect to the labour, to the mother or to the child, as the amount given was so small. Of the air inhaled, a variable proportion was passed over ether in the tank and the remainder was pure. A ratio of about 1 : 16 to 1 : 8 was the average required, and four to eight breaths gave relief. By advancing the ratio anæsthesia could be induced for the use of forceps, perineorrhaphy and similar obstetric manœuvres. The apparatus had not been tried for abdominal work, and it was doubtful whether it would give sufficient relaxation; but it was quite efficient for the purposes mentioned. A hot-water bottle on the tank in cold weather was a help. Dr. Small went on to say that there was remarkably little nausea or sickness, even when anæsthesia had been induced for birth of the head *et cetera*. The exhaled air mixed with unused ether vapour was not inflammable at the outlet valve if the ratio was 7 : 16 or less. Above this, it took fire and burned slowly when collected over water and ignited. Dilution in a room would make it safe and, moreover, no liquid ether was exposed to flame (such as a lamp or fire), as occurred when an open mask was used. Valves, operating with inhalation and exhalation, maintained a one-way circuit, and also prevented escape of ether from the tank when the apparatus was not in use. Those patients (95%) who could use it, experienced considerable relief, though not in all cases was there total elimination of the sensation of pain. Most patients said that it took the agony out of the labour and left just a dull pain. Many had felt the child actually being born without much pain, and a few without any pain at all. There was a wide variation in the dose required, according to individual susceptibility and to the type of breathing. Deep breathers naturally got a larger dose of ether. The main thing was to set the ratio at a point at which the patient expressed relief, and then to leave it at that for as many hours as were necessary. The obstetrician did not need to attend till the last stages, and there was no need to stand by giving anæsthetics. An advantage was that if the ratio was increased to 1 : 2 or more, the labour could be slowed up with safety pending the arrival of the medical attendant. The amount of ether used was about one and a half ounces per hour, including anæsthesia for the use of forceps, perineorrhaphy *et cetera*.

Obstetrical Cinematographic Films.

PROFESSOR J. C. WINDEYER showed two films, the first one entitled "The Effect of Intravenous Injection of Ergometrine on the Human Puerperal Uterus", produced by Professor Chassar Moir. This film illustrated in a simple fashion the rapidity with which ergometrine acts in producing powerful and prolonged contractions of the musculature of the uterus during the puerperium. The action of the drug was shown on a patient as well as by means of a tracing of the contractions of the uterus, both before and after the injection of the drug. Ergometrine by intravenous injection produced its effect within 45 to 60 seconds.

The second film shown was one produced by Dr. C. McIntosh Marshall, of Liverpool, who had kindly consented to let Professor Windeyer have a copy.

Professor Windeyer, in describing this film, said that it illustrated quite a number of points in the treatment of breech delivery, and more particularly breech presentations with extended legs. In most cases local anæsthesia of the perineum had been produced by the injection of a 0·5% solution of "Novocain" as the breech came into view; ironing of the pelvic floor was proceeded with and a mediolateral episiotomy was painlessly performed later if it seemed necessary. Dr. Marshall advised episiotomy in primiparous women, the episiotomy being performed on the side on which the sacrum descended. With extended leg breech presentation, steady anterior groin traction was made during the pains till the anterior buttock was below the pubis and the posterior one distended the perineum; at this stage episiotomy was performed, and with continued traction the buttocks were delivered, after which chloroform was administered.

As the umbilicus came into view the legs were flexed by pressure in the popliteal spaces directed away from the mid-line, the cord was drawn down, the buttocks were grasped and gentle traction was maintained; if resistance to traction was experienced the arms were brought down, the posterior one usually first. The body of the child was then allowed to hang from the vulva. In some cases the amount of visible neck at once lengthened, and the head of the child was delivered by leg traction as described by Burns. Marshall recommended suprapubic pressure in addition to leg traction if the head did not readily enter the brim.

The film ended with two cases which illustrated the extraction of the after-coming head with forceps. Professor Windeyer said that although the amount of traction applied to the fœtus seemed at times to be excessive, Dr. Marshall's results were exceptionally good; he had reported only two dead infants in seventy-two cases, and this was a fœtal mortality rate in breech presentations that anyone would be proud of.

NOMINATIONS AND ELECTIONS.

THE undermentioned has applied for election as a member of the Tasmanian Branch of the British Medical Association:

Braithwaite, Peter, M.B., B.S., 1937 (Univ. Sydney), Royal Hobart Hospital.

The undermentioned have applied for election as members of the South Australian Branch of the British Medical Association:

Formby, Richard Harper, M.B., B.S., 1937 (Univ. Adelaide), Strathalbyn.

Turner, Frederick Gordon Trevor, M.B., B.S., 1936 (Univ. Melbourne), 98, Unley Road, North Unley.

Verco, Geoffrey Webb, M.B., B.S., 1937 (Univ. Adelaide), Adelaide Hospital.

The undermentioned have been elected members of the South Australian Branch of the British Medical Association:

Davis, Hubert Garth, M.B., B.S., 1937 (Univ. Adelaide), Adelaide Hospital.

Greenlees, Rollo, M.B., B.S., 1937 (Univ. Adelaide), Adelaide Hospital.

Hayes, Desmond Thomas Matthew, M.B., B.S., 1936 (Univ. Melbourne), 91, McLellan Street, Ararat.

Smith, Gavin Viner, M.B., B.S., 1937 (Univ. Adelaide), 45, Marlborough Street, St. Peters.

Turnbull, Gordon McLeod, M.B., B.S., 1937 (Univ. Adelaide), Adelaide Hospital.

Medical Societies.

THE MELBOURNE PÆDIATRIC SOCIETY.

A MEETING of the Melbourne Pædiatric Society was held at the Children's Hospital, Carlton, on September 8, 1937, DR. ROBERT SOUTHBY, the President, in the chair. Part of the report of this meeting was published in the issue of March 19, 1938.

The Commoner Neonatal Diseases.

DR. KATE CAMPBELL introduced a discussion on the commoner neonatal diseases by a lecturette on the subject, illustrated with some lantern slides.

Dr. Campbell stated that intracranial hæmorrhage was the commonest cause of death in the neonatal period. It was said to be responsible for 20% of the deaths, and it had been said that one baby died of it for every twelve born, but in Dr. Campbell's experience in Melbourne the condition was not so common a cause of death as these figures indicated. The three types of intracranial hæmorrhage were classified (*a*) as traumatic, (*b*) as one manifestation of hæmorrhagic disease of the new-born, and (*c*) as a symptom occurring in severe icterus or infection. The traumatic type could be subdivided into hæmorrhage occurring through tears in the *tentorium cerebelli* or the *falx cerebri* on the one hand, or from the chorioidal plexus into the ventricular system on the other. This type of hæmorrhage occurred in difficult vertex labours, particularly if instruments were used, in breech deliveries, in precipitate labours, or in premature labours perhaps because of the delicacy of the blood vessels.

Death quickly followed on very gross intracranial hæmorrhage, and these babies were usually stillborn. In mild cases occasional attacks of cyanosis or twitching might be the only symptoms. In more severe non-fatal cases the infants required a lot of resuscitation; the nutrition especially of the respiratory centre was interfered with, atelectasis was produced, and these areas were specially liable to become pneumonic. Of resuscitated infants, 20% to 30% died, and the usual sequence of events was intracranial hæmorrhage, atelectasis and pneumonia. The infants became drowsy, might have attacks of screaming for no apparent cause, sucked badly and had difficulty in swallowing; they were cyanotic, with slow pulse and intermittent rigidity, and were likely to twitch or have convulsions; bulging fontanelle was a later sign, and it was unusual to be able to identify the site of the hæmorrhage from the signs. The mode of resuscitation for the babies with *asphyxia livida* was to remove mucus from the upper respiratory passages, keep the head low, administer "Carbogen", massage the spine, slap the baby smartly and immerse the body in cold water or spirit; artificial respiration was usually ineffectual. In the resuscitation of babies with *asphyxia pallida* gentleness was required; "Carbogen" should be administered and an injection of a stimulant, such as "Coramine", should be given; the baby should not be slapped, but should be given a warm bath at a temperature of 105° F. After resuscitation babies with intracranial hæmorrhage should be nursed in Fowler's position, with the back and head upright; an intramuscular injection of fifteen to twenty cubic centimetres of whole blood should be given; the

baby should be nursed in the bassinet and should not be disturbed for feeding, bathing or changing. Moncrieff had advocated the rectal injection of one ounce of 10% saline solution; "Carbogen" and "Coramine" should be used from time to time in the presence of atelectasis. Bromide and chloral mixtures were advised for the sedative effect, but Dr. Campbell considered that lumbar puncture was not always necessary, might be difficult with a struggling infant, and might be harmful if a medullary pressure cone was produced or an anæsthetic was administered. The prognosis for immediate mortality according to some authorities was 48%; if death did not occur immediately, some of the babies would die later and many others would be paretic-spastic or affected mentally.

Dr. Campbell then discussed atelectasis. She said that in early fœtal life the alveoli of the lungs were lined by columnar epithelium and at a later stage by cuboidal epithelium; as the fœtus approached term the cuboidal epithelium became flattened, favouring the dehiscence of the alveoli with respiration; the aeration of the alveoli caused the opening of the alveolar capillaries. In very premature infants the alveolar epithelium had not reached the flattened stage; the alveoli were not capable of expansion and therefore the lungs were not capable of full expansion. The lung became aerated first along the anterior borders, then the upper lobe expanded, and the lower lobe posteriorly was last to expand; the last-mentioned site was the commonest for atelectasis, which was usually partial and might be unilateral or bilateral. The causes of the condition were intracranial hæmorrhage, prematurity, the insufflation of foreign matter in the bronchial tree, or the presence in the thorax of an ectopic viscus (as sometimes in diaphragmatic hernia) or the presence of a tumour. Some cases were so mild as to give rise to no symptoms; the infant might have cried normally at birth and might have been of good colour. In more severe cases the baby was sick; was cyanosed continuously or in paroxysms; had respirations restricted largely to the thoracic type with or without retraction; occasionally profuse bronchorrhœa occurred with frothing or bubbling from the nose and mouth; and as a rule the babies sucked badly.

The infant should be nursed on the good side, propped up in Fowler's position, and moved as little as possible. "Carbogen" and "Coramine" were usually required, and sometimes brandy was given; the injection of one two-hundredth of a grain of atropine sulphate for an infant of average weight was at times helpful. The prognosis depended largely on the cause, but was best in those cases due to the aspiration of non-infected material.

Dr. Campbell's next subject was bronchopneumonia of the new-born. She said that this was relatively a common condition, coming on most frequently on the fifth to the seventh day after birth. It had been said that it accounted for 4% of neonatal deaths. The post-atelectactic type should be differentiated from the insufflation type. In the former type the preceding atelectasis might or might not have been definite enough to produce symptoms; it was generally agreed, however, that all neonatal pneumonias which were not insufflational were of this post-atelectactic type. In the absence of evidence of preceding atelectasis the bronchopneumonic symptoms most often came on with unexpected collapse. The baby would become cold and pale, temperature would be subnormal and the pulse weak, convulsions sometimes occurred at the onset, the respirations became rapid and then very rapid, cough was absent, but the temperature rose soon perhaps to 104° F. and the clinical picture became obviously pneumonic. Some impairment of the percussion note and diminution of the vesicular murmur with fugitive occasional crepitations were the usual physical signs. In cases preceded by obvious atelectasis the infants became worse generally with rising temperature and pneumonic respirations.

In the insufflation type the baby was always extremely cyanosed and the symptoms were obvious within a few hours of birth. There was always associated atelectasis, and the temperature rose to a moderate degree almost immediately; very soon the pneumonic respirations were evident and adventitious physical signs were plentiful.

The treatment of neonatal bronchopneumonia was based on the fact that it was a self-limited disease and that help could be given by measures directed to keeping the baby alive long enough to allow for spontaneous recovery. More than 50% of the patients recovered. The baby should be nursed on the affected side in Fowler's position, with elevation of the upper part of the body, and should be disturbed as little as possible. It was not advised that applications or poultices to the chest should be used. A "Carbogen" tent from the outset was of great value, and stimulants were usually required. It was necessary to guard against abdominal distension.

Dr. Campbell next discussed the causes of cyanosis of the new-born other than atelectasis, intracranial hæmorrhage and bronchopneumonia. She said that diaphragmatic hernia was encountered with reasonable frequency; the main symptoms in definite cases were cyanosis, dextrocardia and abnormal signs at the base of the left lung. Thymic tumours might cause cyanosis and atelectasis. Congenital heart defects often caused cyanosis, though frequently, as in trilocular heart, no bruit might be audible.

With reference to hæmorrhagic disease of the new-born, which was frequently encountered, Dr. Campbell said that it often occurred in small epidemics and might affect one twin and not the other; the incidence was said to be approximately 1% of all births, and according to Kruickshank it was responsible for 10% of neonatal deaths. The coagulation time was prolonged and probably also the bleeding time. The infant might have a raised temperature. The age period affected was as a rule from the first day to the fifth day. The sites of hæmorrhage varied in different cases, but might be the bowel, stomach, mouth, umbilicus, subcutaneous tissues, retroperitoneal tissues, intracranial tissues, renal tract or cephalhæmatoma. The treatment advocated was the administration of whole blood—fifteen to twenty cubic centimetres given intramuscularly and/or an intravenous injection of ten to fifteen cubic centimetres per pound of body weight. Dr. Campbell emphasized that the blood should always be typed before intravenous introduction, because agglutinogens were present in the corpuscles of from 15% to 20% of infants.

Dr. Campbell discussed icterus affecting new-born infants under the headings (*a*) *icterus neonatorum*, (*b*) *icterus gravis*, (*c*) congenital obliteration of bile ducts, (*d*) congenital syphilis, (*e*) sepsis. Leaving the discussion of (*a*) and (*b*) till later, she said that congenital obliteration of bile ducts was more commonly a progressive cholangitis than a true stenosis. The meconium was normal in colour, but at the end of the first week the stools became white; jaundice might not be obvious until the third week. Enlargement of the liver and the spleen with vomiting and nose-bleeding completed the picture. A plug of inspissated bile might mimic the symptoms in the early weeks; it might then be passed and recovery follow. Exploratory laparotomy was generally advisable. Syphilitic jaundice was rare (it had occurred among 0·7% of 9,000 consecutive patients at Queen Victoria Hospital antenatal clinic) and the diagnosis would be made by the Wassermann test and associated symptoms and signs. In septic jaundice the symptoms of the causative sepsis would be present.

Icterus neonatorum was "physiological"; various estimates of incidence were that it occurred in 15%, 60% to 80% of full-time and 100% of premature babies. It occurred on the third or fourth day, and was not very intense. Drowsiness would be the only symptom; the sclerotics were generally not affected; there was no bile in the urine and the motions were of normal colour. It generally cleared up by the eighth to tenth day or even earlier. It was a hæmolytic jaundice, the serum giving the indirect Van den Bergh reaction. No treatment was required and none influenced the condition.

The commonly accepted theory was that the fœtus lived under conditions of relative anoxæmia, the placenta as a respiratory organ being less efficient than the lung; also

all the organs except the liver got a supply of mixed blood. To make up for this oxygen want the fœtus required a larger number of red cells in the blood than was obtained in extrauterine life; there was therefore a high red blood count, the circulating blood containing many more fragile nucleated immature red blood cells. In earlier fœtal life the main centres of hæmatopoiesis were the liver and spleen, but towards term the bone marrow took over this function. The bilirubin content of the fœtal blood increased as gestation advanced, being higher in the full-time than in the premature infant; at birth it was five times the bilirubin content of the mother's blood, and the red cell count was from 5,500,000 to 7,000,000 cells per cubic millimetre.

With the better oxygenation which prevailed in extrauterine life there was not the need for the polycythæmia. Hæmolysis, which never occurred in health after this period, took place with the breaking down of hæmoglobin and consequent production in large amount of bilirubin, the content of which in the blood increased till the third or fourth day. It had been demonstrated that the efficiency of the new-born liver was impaired owing to its immaturity, this being more particularly evident in the premature infant; the immature liver cells were unable to excrete the bilirubin from the blood in the sinusoids and passed it on to the biliary canaliculi; in this way the bilirubin reached the general circulation and jaundice developed. Whether or not the infant showed physiological icterus would depend on the degree of impairment of liver function and the rapidity with which the cells took up their excretory work.

Dr. Campbell said that this consideration of *icterus neonatorum* brought them to the three conditions which were grouped together as fœtal erythroblastosis, namely, congenital œdema of the fœtus, *icterus gravis* and anæmia of the new-born. These conditions occurred more frequently than was supposed; in the past twelve weeks she had been fortunate enough to come across ten instances.

Fœtal erythroblastosis was characterized by the presence of extramedullary centres of hæmatopoiesis in the liver and spleen, and they might occur elsewhere; in nearly every case an erythroblastæma was present. In the normal infant the nucleated red cells should not exceed five cells per hundred white cells on the first day of life, or one per hundred white cells on the second day, and there should not be any nucleated red cells on the third day. In fœtal erythroblastosis the count was generally above 5,000 nucleated red cells per cubic millimetre. There were two theories, neither of which explained the condition satisfactorily. According to the first, hæmolysis was unchecked because of a failure in production of anti-hæmolysin factor by the liver causing erythroblastosis by the second day. According to the second, hæmolysis was secondary to a primary over-production of nucleated red cells. After recounting the details of two women's pregnancies, bringing out the point that they each contained evidences of the different types of erythroblastosis, Dr. Campbell discussed the three types separately. Congenital œdema of the fœtus was the most severe type, in which the infant was born œdematous, with enlarged liver and spleen and heart. The *liquor amnii* was often bile-stained and there was frequently a state of hydramnios. The placenta was usually twice the normal size. The theory had been advanced that the primary cause was an increase in the fibrous tissue within the placental villi, which caused interference with the aeration of the fœtal blood, producing a degree of fœtal anoxæmia greater than usual; the fœtus responded by a greater call on the blood-forming organs, with a greater polycythæmia and a larger number of nucleated red cells in the blood. It was also said to increase the blood pressure of the fœtus so that hypertrophy and enlargement of the heart developed. It had been suggested that many miscarriages were due to this condition prevailing in a more severe form at an earlier fœtal age, and histological examinations of the tissues of the aborted fœtus had upheld this view. Dr. Campbell said that at the Women's Hospital she had recently had under notice a mother who had given birth to premature binovular twins. The first twin was stillborn, with congenital œdema, and hydramnios was present; the second twin was born alive, but rapidly developed jaundice and died of *icterus gravis* within twenty-four hours. The mother had had a number of other stillborn babies. To the pædiatrician it was the ætiology of the condition which was of interest.

In *icterus gravis* the icterus came on usually within the first thirty-six hours of life; it deepened rapidly. In typical cases the infant ran a temperature, looked ill, often vomited and was drowsy and difficult to feed. The liver and spleen were enlarged, and the heart was sometimes enlarged; at times the infant was dyspnœic. The urine contained bile. The Van den Bergh test gave a biphasic reaction. In nearly all cases the blood examination demonstrated the presence of anæmia and erythroblastosis. In severe cases the icterus progressed very rapidly; the infant usually became œdematous and there was a tendency to hæmorrhage; often the hæmorrhage was intracranial. The infant might die in the first two or three days or survive into the second week. In other instances the condition was milder and the babies recovered spontaneously. All the children in the family might be affected, or the condition might occur sporadically in the children of the same mother. It had been said that the first child was spared, but in Dr. Campbell's experience this point had not been borne out.

In any case of jaundice in a new-born infant the liver and spleen should be palpated and the urine examined for bile; if the findings were positive a blood film or a complete blood examination was indicated. Prompt treatment was very desirable; the mortality in untreated cases was about 80%.

The treatment was by transfusion of blood, repeated in three or four days if the red cell count fell below 4,000,000 cells per cubic millimetre. It was unwise to use the anterior fontanelle. In addition, glucose solution should be administered by mouth. It was wise to give a prophylactic transfusion of blood on the first day to a new-born baby whose mother had had previous babies with erythroblastosis.

The sequelæ of *icterus gravis* were: (*a*) Intracranial hæmorrhage. (*b*) Nuclear jaundice causing disappearance of the cells, with excessive development of neuroglial tissue and demyelination of the axones. Rigidity, athetoid or choreiform movements, convulsions, *petit mal*, ataxia or mental defect resulted. (*c*) Damage to liver cells and splenic cells, with fine fibrosis, which might lead to the symptoms of cirrhosis, especially if the cells had been damaged by excessive fœtal anoxæmia. (*d*) Kinnier Wilson's disease. (*e*) Possibly congenital idiopathic cardiac hypertrophy.

The mildest manifestation of fœtal erythroblastosis was anæmia of the new-born, which generally showed up towards the end of the first week or in the second week. When anæmia developed, it was likely to progress rapidly, with well-defined enlargement of the spleen, but necessarily associated with jaundice. The treatment was by transfusion of blood. Dr. Campbell related a typical history. A mother confined with her fifth baby had lost the previous two infants on the ninth day and the tenth day respectively with jaundice. The new baby appeared to be well for three days, but on the fourth day was noticeably pale and the spleen was enlarged. The hæmoglobin was estimated at 50%. The baby was given a transfusion of blood on that day and again four days later, and recovered.

In conclusion, Dr. Campbell passed over rapidly the subjects of cutaneous and umbilical sepsis, nephritis and pyelitis, and metabolic conditions, such as breast activity, vaginal hæmorrhage, transitory fever of the new-born and œdema associated with subnormal temperature.

PROFESSOR R. MARSHALL ALLAN, who had been invited to the meeting to open the discussion, expressed his appreciation of the services of Dr. Kate Campbell, who so ably advised the members of the honorary and resident staffs at the Women's Hospital and delivered some of the lectures at the university on the neonatal conditions. In her address that evening she had given further evidence of her understanding of the subject under discussion, and of her capacity to express herself lucidly.

Among 3,713 consecutive deliveries at the Women's Hospital there had been 97 neonatal deaths and 177 stillbirths. The neonatal deaths were caused by prematurity, 42 cases; birth injuries, 14 cases; atelectasis, 11 cases; insufflation asphyxia, 11 cases; other causes, 19 cases, including only one with melena. The stillbirths were due to asphyxia, 66 cases; maceration, 34 cases; birth injuries, 25 cases; prematurity, 20 cases; other causes, 32 cases, including five due to malformations.

It was evident from these figures that prematurity and birth injuries were the most important causes of the loss of infants in pregnancy. He would like to stress the important rôle of the toxæmias of pregnancy in the ætiology of prematurity. The toxæmias caused the greatest number of deaths within forty-eight hours of delivery; this was therefore more an obstetric than a pædiatric problem. If the child was delivered too early, it was generally non-viable; if it was delivered too late, infarction of the placenta was possible, with premature separation and stillbirth. There might be some truth in saying that a seven-months child had a better chance of survival than an eight-months child, because, when toxæmia was present, it was not likely to be as severe at seven months as at eight months, and the longer action on the fœtus increased the risk of damage and the likelihood of neonatal death. In the toxæmias Professor Allan considered that tubal induction was a risky mode of delivery; that normal delivery or "low forceps" with episiotomy carried the best prognosis, and breech presentation the worst; and that Cæsarean section was dangerous because of the use of morphine and general anæsthetics. He expressed the opinion that a good, careful nurse was worth a dozen incubators to a premature baby, and might mean the difference between life and death. He was interested in opinions as to the value of œstrin therapy in prematurity; œstrin was excreted rapidly in the first four days, and this led to a lack of stimulation in comparison with the intrauterine state of the fœtus going to full term. The fate of premature babies was not enviable; half of them died before the end of the first year; opinion was divided on the fate of the survivors; it was generally considered that after a slow start they made normal progress. Capper, after studying the post-war results in Vienna, had stated that the immature infant became the backward school child and was a potential psychopathic or neuropathic patient and even a potential candidate for the homes for imbeciles and idiots. Professor Marshall Allan felt that Capper had overstated the position.

Referring to birth injuries, Professor Allan said that the treatment of cephalhæmatoma was absolute neglect, and that depressed fractures of the skull should be raised at once with a vulsellum forceps. He raised the question of the possible value of a suitable modification of Drinker's apparatus for artificial respiration of infants with cerebral hæmorrhage instead of using the "Carbogen" tent. He wondered whether blood should be given intramuscularly more frequently and whether spinal puncture was as harmful as Dr. Campbell had inferred. Recent work tended to show that many of the spastic diplegias were due to aplasia of the brain tissue caused by congenital defects or infection *in utero* rather than by cerebral hæmorrhage; the head in such cases tended to be microcephalic; the relationship to hydrocephalus was not so certain.

Dr. Campbell had given them an excellent account of *icterus neonatorum* and of erythroblastosis. Professor Allan had wondered whether these conditions were simply due to a decrease in red cells and hæmoglobin immediately after birth or were dependent on physiological changes associated with the change-over from the placental circulation and the awakened portal circulation. The function of the bone marrow as a blood-former was not much in evidence before birth; hence jaundice occurred because of increased hæmatopoietic activity and decreased excretory activity. Erythroblastosis, of course, was an abnormal condition. *Icterus gravis* tended to develop earlier than physiological jaundice. The treatment for these abnormal conditions was early and frequent transfusion of blood.

He would not discuss atelectasis fully, because this had been done by Dr. Campbell; the dominant factor was often cerebral hæmorrhage with interference with the respiratory centre, but it was at times associated with inspiration of *liquor amnii*, and in prematurity the respiratory centre was poorly developed and there was no force to separate the moist surfaces of the air passages. During the early neo-natal period the infant required few functioning alveoli to be comfortable, and in the prevention of atelectasis it was of importance to make the infant cry lustily at birth. Massive collapse of the lung was usually due to the aspiration of a plug of mucus and the blocking of a large portion of the bronchial tree. Pneumonia of the post-atelectactic type was due to the aspiration of *liquor amnii*, especially if it was infected, as in tubal induction.

Professor Allan referred briefly to infantile tetany and calcium and parathyreoid therapy; to rare instances of diphtheria due to a carrier rather than acquired through the placental circulation; to tuberculosis, of which he had seen a case but had not verified that the placenta was affected; and to pemphigus, which was so common in America but so rare in Australia. He also mentioned that only four out of thirteen instances of *ophthalmia neonatorum* were due to Neisserian infection.

In conclusion, Professor Marshall Allan expressed the opinion that there was need for collaboration between obstetricians and pædiatricians on the subject under discussion, and emphasized this opinion by relating some anecdotes of experiences abroad.

Dr. D. F. Lawson expressed his appreciation of Dr. Campbell's paper and acknowledged the help she had given members of the resident medical staff at the Women's Hospital. Dr. Lawson had been impressed by the way in which the toxæmias of pregnancy affected the infants as well as the mothers. He also mentioned the low blood calcium figures of babies in the neonatal period, and spoke of the calcium deficiency in relation to fœtal rickets and liability to infection. He had reached the conclusion that the morbidity due to hæmorrhagic diathesis and the icteric group were preventible; he stressed the importance of careful consideration of the diet in pregnancy.

Dr. J. B. Colquhoun, after thanking Dr. Campbell for her paper, said that he was disappointed that the outlook in neonatal diseases was so gloomy. He had risen to digress from the subject matter of the paper by referring to the congenital deformities, which were relatively common in Melbourne. For instance, in congenital dislocation of the hip joint it was important that an early diagnosis should be made with a view to early treatment. Putti, of Bologna, as a result of early diagnosis, claimed 95% to 98% of successful results of treatment. Nothing approaching these figures was attainable unless the diagnosis was made very early in life. He put in a plea that all new-born babies should be subjected to radiography. As a start, whenever it was necessary to prepare a skiagram of a baby, it should be made on a large film, big enough to include the pelvis. Whenever an obstetrician had any suspicion of the possibility of the presence of congenital dislocation of the hip joint, a skiagram should be prepared without delay. Recently he had been fortunate enough to be able to commence treatment early on two occasions; in one case at eleven weeks and in the other at eight weeks; the reduction and management in these cases had been comparatively easy, and he was sanguine that permanent cures would follow.

Dr. H. Boyd Graham, after adding his congratulations to Dr. Campbell, referred to the importance of preventing the initial loss of weight of new-born babies, particularly if the birth weight was low. He preferred to use the term "dehydration fever" rather than "transitory fever" mentioned by Dr. Campbell, with the object of concentrating attention on the serious effects of continued dehydration. He had found the oral administration of the hydrating fluid introduced by Kugelmass of great value in this respect. The fluid consisted of gelatine (6%) and dextrose (3%) in 0·5% sodium chloride solution. He had used it with great satisfaction not only for premature and frail underweight babies, but for older infants who were

dehydrated. He also mentioned the value of air-conditioning and of thyreoid and iron for premature babies. He commented on the omission by Dr. Campbell of mongolism from the commoner neonatal diseases, and referred to the frequency with which parents heard from pædiatricians of the ominous prospects of a mongol baby for the first time when the baby was older and had failed to sit up normally; he thought that the parents would be less disappointed and obstetricians less discredited if the parents were informed of the presence of this condition in the neonatal period.

DR. IAN WOOD supported Dr. Campbell in her advocacy of blood examinations in the neonatal period. In the hæmorrhagic diseases there was usually a high reticulocytosis with excessive polychromasia and the presence of premature white cells. Dotted in the liver and spleen and in the lymph glands were islands of extramedullary erythropoietic areas. In the hæmorrhagic condition Dr. Wood considered that blood should be injected intramuscularly; but it should be recognized that this was not the best route and quite possibly it was entirely useless. It was quite certain that there was a tendency to spontaneous recovery, which at times might be attributed improperly to the treatment. Transfusion of blood was far superior and should be resorted to before the infant was moribund; it was important that careful attention should be paid to blood grouping.

DR. F. K. NORRIS also expressed his appreciation of the paper and of the collaboration of obstetricians and pædiatricians in the care of the baby. He referred to sclerema as worthy of consideration in the discussion; it was not so rare as the text-books stated; he had come across as many as three cases in one month. There was a tendency to regard these babies as the subjects of spastic paralysis; they were very cold and solid, but not œdematous, and they always died. He had been interested in a baby with scoliosis and lung disability following on birth fracture of the clavicle. At the age of fourteen months the shadow on the left side of the chest had lessened; it was an example of uniform hæmothorax from fractured clavicle. He supported what Dr. Boyd Graham had said about dehydration or inanition fever and the importance of the recognition and appropriate early treatment of dehydration.

DR. DOUGLAS GALBRAITH referred to the opinion that was commonly held, that if one used the mother's blood the risk of transfusion to a young baby was negligible. Blood incompatibility occurred even between a mother and her new-born baby, so this was a dangerous doctrine. He also mentioned an instance of hæmorrhage from the renal tract, the sequel of which was that when the baby was seven months old there was a palpable mass in the loin with pyrexia, which was later found to be caused by hydronephrosis.

DR. J. W. GRIEVE raised the point of the time of onset of melena and the prognosis. He thought the prognosis was better if the melena occurred later.

DR. ROBERT SOUTHBY said that Dr. Campbell's paper was full of points important from the teaching point of view. More work was required on the tendency of premature babies to hæmorrhages. He wondered why "Carbogen" was preferred to oxygen for cyanosed infants; oxygen made them pink. He supported the statement that if a new-born baby had to be spanked to commence breathing, it should be spanked properly. He would like to add difficulty in suckling to the symptoms of intracranial hæmorrhage. The intravenous rather than the intramuscular route should be used very early when it was desirable to introduce blood. It was a good rule never to put a needle into the sagittal sinus in a jaundiced baby, because of the tendency to bleeding. With reference to the detailed family histories of fœtal erythroblastosis given by Dr. Campbell, Dr. Southby had noticed that each of these young mothers had had three normal infants and then a sequence of calamities; it had occurred to him that the drain on a mother's metabolism might predispose to that sort of thing. In conclusion, he asked Dr. Campbell whether any association had been established between nephritis of the new-born and maternal toxæmia of pregnancy.

Dr. Campbell, in reply, said that she was pleased with the way in which her remarks had been received, and she had enjoyed her work at the Women's Hospital and at the Queen Victoria Hospital. In reply to Professor Marshall Allan, though œstrin had been used, she had not obtained any assessable results yet. The after-development of premature babies was well described by Hess, who was encouraging; the females caught up at about one year of age, the males at four years approximately, and after that one could not distinguish them from normal children, and as a rule the mental development was also along normal lines. The Drinker type of respirator for babies was favourably looked on in the United States of America, but Dr. Campbell had not heard of its use in Australia. She had come across only one case of congenital tuberculosis; the mother died of tuberculosis two days after the delivery of a baby who died of disseminated tuberculosis at the age of twelve weeks. In reply to Dr. Lawson, she said that the study of the feeding of the mother was a hopeful field of inquiry from the biochemical aspect. She promised Dr. Colquhoun that she would bear in mind what he had said about congenital dislocation of the hip. She agreed with Dr. Graham that it was not wise to let a four-pound baby lose more weight; it was her practice to give these babies more food earlier. Even the nurses were able to recognize mongol babies. She had been interested to hear Dr. Norris say that he had seen three examples of sclerema in one month, because she had not yet come across an instance of true sclerema, but had had some babies with pseudosclerema and some with sclerœdema who had done quite well. In reply to Dr. Grieve, she stated that she agreed that early melena carried a graver prognosis, and it was a rule at the hospital to give a transfusion always if hæmorrhage from the bowel occurred on the first day. In reply to Dr. Southby, she said that the incidence of intracranial hæmorrhage in stillborn premature babies was very high; and that "Carbogen" was preferred to oxygen because the carbon dioxide diffused out of the blood at a greater rate. She did not think that fœtal erythroblastosis had anything to do with sexual exhaustion of the mother. It had been a coincidence that she had selected the family histories she had used that night. She could recall a number of instances in which there was no such suggestion.

Obituary.

FREDERICK ARCHIBALD HOPE MICHOD.

WE regret to announce the death of Dr. Frederick Archibald Hope Michod, which occurred on March 18, 1938, at Brisbane, Queensland.

Australian and New Zealand Association of Radiology.

THE annual meeting of the Australian and New Zealand Association of Radiology will be held at Sydney from April 4 to 8, 1938.

It is announced that a continuous exhibition of X ray films will be made at Sydney Hospital by members of the association. Professor H. R. Dew has also arranged that a continuous exhibition of X ray films and specimens dealing with hydatid disease shall be held at the Rockefeller Medical School, University of Sydney.

On April 5, 1938, a lecture will be delivered at British Medical Association House, 135, Macquarie Street, Sydney, at 4 o'clock p.m., by Dr. C. Badham on the efficiency of radiologists in diagnosing and forecasting dust diseases of the lungs. The annual meeting will be held at the same place at 8 o'clock p.m.

On April 6 a demonstration will be held at 8.45 o'clock a.m. at the deep therapy department at Saint Vincent's Hospital.

On April 7 a demonstration of selected cases treated by radium and X rays will be held at the Royal Prince Alfred Hospital at 9 o'clock a.m. Dr. H. M. Hewlett will give the annual lecture at 8.30 o'clock p.m. at the British Medical Association House, 135, Macquarie Street.

On April 8 a demonstration of selected cases will be made at the deep therapy department, Sydney Hospital, at 2 o'clock p.m.

Diary for the Month.

MAR. 29.—New South Wales Branch, B.M.A.: Council (Election of Officers and Standing Committees).
APR. 1.—Queensland Branch, B.M.A.: Branch.
APR. 5.—New South Wales Branch, B.M.A.: Organization and Science Committee.
APR. 6.—Victorian Branch, B.M.A.: Branch.
APR. 6.—Western Australian Branch, B.M.A.: Council.
APR. 7.—South Australian Branch, B.M.A.: Council.
APR. 8.—Queensland Branch, B.M.A.: Council.
APR. 12.—New South Wales Branch, B.M.A.: Executive and Finance Committee.
APR. 19.—New South Wales Branch, B.M.A.: Ethics Committee.
APR. 20.—Western Australian Branch, B.M.A.: Branch.
APR. 21.—New South Wales Branch, B.M.A.: Clinical Meeting.
APR. 22.—Queensland Branch, B.M.A.: Council.
APR. 27.—Victorian Branch, B.M.A.: Council.
APR. 26.—New South Wales Branch, B.M.A.: Medical Politics Committee.
APR. 28.—South Australian Branch, B.M.A.: Branch.
APR. 28.—New South Wales Branch, B.M.A.: Branch.
MAY 3.—New South Wales Branch, B.M.A.: Organization and Science Committee.
MAY 4.—Victorian Branch, B.M.A.: Branch.
MAY 4.—Western Australian Branch, B.M.A.: Council.
MAY 5.—South Australian Branch, B.M.A.: Council.
MAY 6.—Queensland Branch, B.M.A.: Branch.
MAY 10.—New South Wales Branch, B.M.A.: Executive and Finance Committee.
MAY 13.—Queensland Branch, B.M.A.: Council.
MAY 17.—New South Wales Branch, B.M.A.: Ethics Committee.
MAY 18.—Western Australian Branch, B.M.A.: Branch.
MAY 19.—New South Wales Branch, B.M.A.: Clinical Meeting.
MAY 24.—New South Wales Branch, B.M.A.: Medical Politics Committee.
MAY 25.—Victorian Branch, B.M.A.: Council.
MAY 26.—New South Wales Branch, B.M.A.: Branch.
MAY 26.—South Australian Branch, B.M.A.: Branch.
MAY 27.—Queensland Branch, B.M.A.: Council.

Medical Appointments.

Dr. E. L. Susman has been appointed Honorary Neurologist and Dr. S. E. L. Stening, Temporary Honorary Relieving Physician at the Royal Alexandra Hospital for Children, Sydney.

Medical Appointments Vacant, etc.

For announcements of medical appointments vacant, assistants, *locum tenentes* sought, etc., see "Advertiser", pages xiv to xvi.

ALFRED HOSPITAL, MELBOURNE, VICTORIA: Two Honorary Assistant Physicians.
DEPARTMENT OF INSPECTOR-GENERAL OF HOSPITALS, ADELAIDE, SOUTH AUSTRALIA: Resident Medical Officer.
MATER MISERICORDIÆ PUBLIC HOSPITALS, BRISBANE, QUEENSLAND: Staff vacancies.
NAREMBEEN ROAD BOARD, NAREMBEEN, WESTERN AUSTRALIA: Medical Officer.
PUBLIC SERVICE COMMISSIONER, MELBOURNE, VICTORIA: Medical Officer.
UNIVERSITY OF CAMBRIDGE, ENGLAND: Diploma in Medical Radiology and Electrology.

Medical Appointments: Important Notice.

MEDICAL PRACTITIONERS are requested not to apply for any appointment referred to in the following table without having first communicated with the Honorary Secretary of the Branch named in the first column, or with the Medical Secretary of the British Medical Association, Tavistock Square, London, W.C.1.

BRANCHES.	APPOINTMENTS.
NEW SOUTH WALES: Honorary Secretary, 135, Macquarie Street, Sydney.	Australian Natives' Association. Ashfield and District United Friendly Societies' Dispensary. Balmain United Friendly Societies' Dispensary. Leichhardt and Petersham United Friendly Societies' Dispensary. Manchester Unity Medical and Dispensing Institute, Oxford Street, Sydney. North Sydney Friendly Societies' Dispensary Limited. People's Prudential Assurance Company Limited. Phœnix Mutual Provident Society.
VICTORIAN: Honorary Secretary, Medical Society Hall, East Melbourne.	All Institutes or Medical Dispensaries. Australian Prudential Association, Proprietary, Limited. Mutual National Provident Club. National Provident Association. Hospital or other appointments outside Victoria.
QUEENSLAND: Honorary Secretary, B.M.A. House, 225, Wickham Terrace, Brisbane, B.17.	Brisbane Associate Friendly Societies' Medical Institute. Proserpine District Hospital. Members accepting LODGE appointments and those desiring to accept appointments to any COUNTRY HOSPITAL are advised, in their own interests, to submit a copy of their Agreement to the Council before signing.
SOUTH AUSTRALIAN: Secretary, 178, North Terrace, Adelaide.	All Lodge appointments in South Australia. All contract Practice Appointments in South Australia.
WESTERN AUSTRALIAN: Honorary Secretary, 205, Saint George's Terrace, Perth.	All Contract Practice Appointments in Western Australia.

Editorial Notices.

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